HERPETOLOGICA

Established 1936

Organ of the HERPETOLOGISTS LEAGUE, A.A.A.S. Associate

Published and Edited by Chapman Grant,

2970 Sixth Avenue. San Diego 3. California

Vol. 5 December 15, 1949 Part 6

AGRICULTURE AND APP... LIBRARY MAY 6 1954 MANHATTAN KANSAS STATE ... SCIENCE

Increasing Abundance of the Alligator in the Eastern Portion of Its Range

By E. ROSS ALLEN and WILFRED T. NEILL

Recently there has been a great deal of controversy, particularly in Florida, concerning the effectiveness of current conservation measures relating to the American alligator. For many years we have studied the alligator in the field, and therefore feel justified in presenting our facts and opinions bearing on this important problem. Studying independently (Allen in Florida, Neill in Georgia and South Carolina), we reached identical conclusions, and have pooled our observations in the present paper.

Early records of travel indicate that the alligator was once remarkably abundant in the Coastal Plain of Florida, Georgia, and South Carolina. We feel that the hide industry was chiefly responsible for the decline of the species in recent times, but believe that the protection afforded it in the last few years has enabled it to increase enormously in numbers.

The following figures, compiled from the records of the leading Florida hide dealers, illustrate the decline of the species during the present century. It should be understood that as alligators became less common, the price of hides rose, and higher prices resulted in more intensive hunting. Thus the relatively few hides taken in the 1940's reflect a disproportionate amount of effort on the part of the professional hunters. The prices listed herein are those paid yearly for a 7-foot hide in No. 1 condition. (Prior to 1940, 7-foot hides brought a maximum price; larger hides brought no more. After 1940, however, larger hides brought even hgher prices than those listed.)

Thus, in 1929, when the best hides brought $1.50 each, 190,000 hides passed through the dealers' hands. In 1930, the maximum price was $2.50, and 188,000 hides were brought in. By 1931 the price had risen to $2.75, and 150,000 hides were secured. The price remained at this level during 1932 and 1933, when 145,000 and 130,000 hides were taken, respectively. In 1934, the best hides were bringing $3.00 each, and 120,000 were secured. The price remained constant through 1935 and 1936, when 162,000 and 150,000 hides were taken, respectively. (During this time, Florida hide-hunters were foraying into Georgia more and more; this may account for the relatively large number of hides taken during these years.) In 1937 the price was $4.00, and 130,000 hides reached the dealers. In 1938 the price was still $4.00, and 110,000 hides were taken. By 1939 the price stood at $5.25, but only 80,000 hides were secured. In 1940 the figure was $7.00, and 75,000 hides were taken. Thereafter, the decline of the alligator in Florida was rapid. In 1941, the price was $8.75, and 60,000 hides were secured. In 1942, the price leaped to $15.75, but only 18,000 hides were brought in. In 1943, in spite of a price of $19.25 for a 7-foot hide (and more for larger ones), only 6,800 hides were taken.

As early as 1935, the senior author began a campaign for legal protection of the alligator in Florida. His proposals met with violent opposition from several sources; and, although some counties afforded the alligator temporary, local

MAY 6 1954
MANHATTAN
KANSAS

protection, no decisive legal action was taken until 1943. Since 1944, the species has been generally protected in Florida during its breeding season; specimens under 4 feet in length have been protected at all times of year.

The effect of legal protection was soon evident. In 1944, a 7-foot hide brought $21.00, and 7,000 hides were taken during the open season. In 1945, the price reached $22.75, and 12,000 hides were taken. In 1946, the increasing abundance of the species lowered the price to $15.75, and 10,000 hides reached the dealers. By 1947 the price had dropped to $13.30, and 25,000 hides were brought in.

The experiences of the senior author corroborate the fact that the alligator declined rapidly between 1925 and 1945, but made a marked recovery after protection had been afforded. From 1925 to 1929 he collected alligators alive for shipment to zoos, exhibits, etc. Thousands of specimens were captured during this period of time, most of them in Polk County, Florida. In a year's time, 1928-29, 7,200 alligators were taken alive. Often 60 or 70 specimens could be caught in a night; on one occasion 94 were taken. (Since so many could be taken alive, it is obvious that hide-hunters, with rifle or shotgun, could secure many more; and thus it is not surprising to learn that, during this period, one single family, all professional hide-hunters, killed 20,000 alligators in a year.) At this time large alligators, 10 to 12 feet in length, were not rare.

In 1929 the senior author transferred his operations to Marion County, Florida. At that time alligators were abundant in the vicinity, but the older hide-hunters were even then commenting on the scarcity of large specimens. Between 1931 and 1936, from 20 to 50 alligators were often taken in a night's hunting. In 1937-38, it was still possible to find this many specimens, but to do so, it was necessary to put forth considerable effort and to invade the more inaccessible areas. In 1939-40, it was difficult to find more than 10 or 15, and often not one would be found. By 1943 even the hide-hunters were lucky to secure one or two a night in Marion County.

In 1948, however, alligators were to be seen in almost all ponds, lakes, and streams in the county. About 75 were living in Silver Springs run alone. In this year, 32 were counted in one corner of Mud Lake; 21, including 7 large ones, were noted in Lake Jumper; 26 were counted along a mile of marshland at Lake Kerr; 17 were seen in a trip across Lake Delancey; 36 were noted in a 2-mile trip along Juniper Creek; 37 were observed in a mile trip along Salt Springs run. The alligators in the last locality were so unafraid that several were "grunted" up to the boat. The above trips were made in a canoe, and no special effort was made to seek out the more secluded localities. Similar observations as to the abundance of alligators were made in many scattered localities throughout the state.

The senior author now receives many requests to remove alligators from private ponds, lakes within cities, farm ranches, etc. Numerous newspaper articles tell of alligators run over on the highway, killed in cities by policemen, attacking dogs and other domestic animals, caught in fences, etc. More and more alligators are being seen in areas where they had well-nigh disappeared.

In Georgia, as in Florida, the alligator was abundant in the early days, and ranged up to the Fall Line in the eastern portion of the state. Prior to the Civil War, alligators were hunted for sport in the vicinity of Augusta, Richmond County. According to contemporary accounts, parties of hunters would make boat excursions down the Savannah River, and spend the day shooting at the alligators which were basking on sand-bars and mud-flats. In 1932, when the junior author began studies in the area, alligators were very rare in Richmond County, and generally lacking in the Savannah River proper, except along its lower course. About 30 miles below the Fall Line, and thence southward, the species was fairly common, but mostly confined to remote lakes and lagoons. In the early 1930's, hide-hunters were only moderately active in Georgia; but during the latter 1930's many parties of hide-hunters invaded the state from Florida, working up through the east Georgia Coastal Plain as far north as Burke County. Their thoroughness was remarkable. They investigated lime-sink ponds, flatwoods ponds, lagoons, backwaters, and artificial lakes, and materially reduced the number of larger alligators in nearly every locality known to the junior author.

The junior author was elsewhere from 1940 through 1945, and no observations were made. During this period the alligator was completely protected by law in Georgia. Upon his return, alligators were found to be more abundant and widespread than ever before. In 1947 they were seen at Silver Bluff, on the Savannah River in Aiken County, South Carolina, where they had never been

KANY 6 1954 MANHATTAN KANSAS

observed previously. In 1948 they were noted at Indian Mound, Aiken County, at the base of the rapids which mark the Fall Line in the Savannah River. Many specimens were noted in ponds and lakes on the southeastern outskirts of Augusta. In Burke, Screven, Jenkins, Bulloch, Jefferson, Washington, and Emanuel counties, Georgia, great numbers of alligators were seen. Northern Emanuel County is characterized by many hundreds of small flatwoods ponds, and each pond investigated contained 5 to 25 small alligators. In the central and southern portion of the Georgia Coastal Plain, the 1948 brood of baby alligators was greater than that of any previous year, the young specimens rambling about and turning up even in pine woods far from water. Local residents report increased depredations on livestock in the last few years.

In South Carolina a somewhat similar situation has prevailed. During the 1930's, alligators were uncommon in the upper Coastal Plain, and fairly common in the lower Coastal Plain, particularly in the extensive marshes and abandoned rice plantations of Jasper, Beaufort, and Colleton counties. In 1947-48, however, alligators were several times encountered up to the Fall Line; nests and eggs were discovered in Aiken County. Small and medium-sized examples were seen in roadside ditches in Hampton, Jasper, Berkeley, Allendale, Beaufort, and Colleton Counties, and even as far inland as Barnwell County. In the marshes and rice fields of Beaufort and Colleton Counties, both large and small examples seemed unusually abundant. In these counties alligators were noted for the first time in salt marshes. The species thrives in marshes where the water is subject to tidal influence but is still fresh, and to a lesser extent is found in brackish marshes; but its occurrence in actual salt marsh was unprecedented in this area, according to local residents. No observations were made in the region north of Charleston County.

The conservation of the alligator is a broad subject and one that presents many facets. It is difficult to refrain from commenting at length on the natural history and ecology of the species. Indeed, a few observations, not entirely pertinent to the discussion, will be presented, in the hope that their general interest may outweigh their partial irrelevancy.

The authors feel that protection of the alligator in the wild is probably the only effective conservation measure. Although captive females may lay eggs, these eggs seldom hatch; apparently alligator breeding and rearing is not feasible. In this connection, an experiment made by the senior author is of interest. A marshy lake, with all the qualifications for an alligator breeding pond, was fenced off. The fence was one mile in length, made of heavy wire imbedded in the ground and bent over at the top to prevent alligators from escaping. Seventy alligators, between 5 and 8 feet in length, were released in the lake. An abundance of food was supplied, but after the first year it was evident that the area was much too small for so many individuals. The stronger ones attacked the weaker ones and seized most of the food. At the end of four years' time, the 70 alligators had been reduced to 12. Of these 12, 2 females made nests and deposited eggs which hatched. Evidently, successful breeding of alligators would be an expensive undertaking.

It has been observed that old male alligators in the wild often fight and kill the younger ones, particularly during the breeding season. It might prove a desirable conservation measure, in some areas, to permit the killing or capture of large specimens, since 5-foot specimens are good breeders. Hide-hunting has been curtailed in Okefenokee Swamp for a good many years, and recently alligators have been very abundant there. The present authors, observing independently, were impressed by the considerable number of specimens over 5 feet in length, and by the scarcity of smaller specimens.

It is felt that the larger alligators, freed from molestation, are becoming increasingly bold in many areas. This is, of course, a highly subjective conclusion, but it is based on very extensive field work on the part of both authors. In this connection, it is interesting to note that the only unprovoked attack upon a human being by an alligator, authentically recorded in recent times, took place in July, 1948, in Weekiwachee Spring run, Florida. Here a male alligator, slightly over 9 feet in length, attacked a local resident, Mrs. Hall Smith, who was swimming alone in the stream. The reptile seized Mrs. Smith's right arm and bit it three times, then released the arm and seized her left hand, with which she was trying to defend herself. Her struggles apparently caused the reptile to release its grip, and Mrs. Smith, her arm and hand badly mangled, managed to get to shore. Messrs. Al Zaebst and Don Russell captured the alligator and then

killed it. Its stomach was opened and found to contain turtle and fish remains, a pine knot, and a stone. Both of the present authors have been attacked by alligators, but the reptiles had always been given some provocation.

Unlike the alligator, the American crocodile has staged no striking comeback. Before 1925 it ranged from Lake Worth, near West Palm Beach, southward to Key West. By 1944 the activities of the hide-hunters had reduced its range to a restricted area about Lake Surprise and Cape Sable, and the region between the Florida Keys and the mainland. The senior author collected 65 specimens in that area in 1937, and noted that hundreds were killed by fishermen who accidentally caught them in their fish nets. Between 1939 and 1944, an operator of a reptile exhibit bought about 300 crocodiles from fishermen whom he had induced not to kill them. The Keys are becoming urbanized to some extent; and the junior author, visiting some favorite collecting grounds, found crocodiles to be rather scarce there in 1947 and 1948. However, the species appears to be at least holding its own in the unsettled areas. In such localities, some specimens can always be found, and many have been seen from airplanes flying low over the area. It is to be hoped that the setting aside of the Everglades as a National Park will enable the species to increase in numbers, for certainly it has come dangerously close to extinction in the United States.

NOTE—The above article was a "Prepublication" issued Nov. 21, 1949 for distribution to persons in Florida who are considering future legislation on conservation of the alligator. "Prepublication" is available to anyone under such circumstances. The authors defrayed the expense.

A New Subspecies of Salamander (Genus *Plethodon*) From Florida and Georgia

By E. Ross Allen and Wilfred T. Neill

We feel that the slimy salamander of southestern Georgia and northeastern Florida is worthy of recognition as a separate subspecies. It is only fitting that the form be named in honor of Dr. Arnold B. Grobman, who has contributed so materially to our knowledge of eastern Plethodons. The new form may therefore be called:

PLETHODON GLUTINOSUS GROBMANI NEW SUBSPECIES

TYPE. ERA-WTN No. 19220; adult female collected October 1, 1949, by E. Ross Allen, Bobby Allen, and Wilfred T. Neill, at the type locality.

TYPE LOCALITY. Half-mile Creek Swamp, about one-half mile northeast of Silver Springs, Marion County, Florida, at a spot roughly one-quarter mile west of the junction of the creek and Florida State Highway 40.

PARATYPES. Thirty-four, as follows: ERA-WTN Nos. 19221-19229, same data as the holotype; ERA-WTN Nos. 19230-19239, topotypes taken October 19, 1949, by Wilfred T. Neill and Gilbert E. Turner; ERA-WTN No. 18218, Paradise Park at Silver Springs, Marion County, Florida, collected February 4, 1949, by E. Ross Allen; ERA-WTN No. 18222, northern Emanuel County, about 2 miles southeast of Midville, Burke County, Georgia, collected August 2, 1949, by Francis L. Rose and Wilfred T. Neill; ERA-WTN Nos. 16663-16666, Shawnee, Effingham County, Georgia, collected November 16, 1947, by Robert L. Humphries and Wilfred T. Neill; ERA-WTN Nos. 16667-16674, 3 miles north of Newington, Screven County, Georgia, collected November 16, 1947, by Robert L. Humphries and Wilfred T. Neill; ERA-WTN No. 18991, Guyton, Effingham County, Georgia, collected September 5, 1949, by Francis L. Rose, John M. Connell, and Wilfred T. Neill.

DIAGNOSIS. A slimy salamander displaying the following combination of characters: back with tiny, scattered dots of a metallic golden color; sides with large grayish spots suggesting lichenous patches; costal groove count 14 or 15, size relatively small.

DESCRIPTION OF TYPE. Head moderately broad, widest just behind the eyes, the sides of the head nearly parallel; snout bluntly rounded. Eye moderate, protuberant. Vomerine patches well separated from the parasphenoid patches.

Tongue broad and flat, filling the floor of the mouth. Trunk moderately stout, cylindrical. Tail circular in cross-section at base, slightly flattened vertically toward tip. Costal grooves 14; one costal interspace between the toes of the adpressed limbs. Snout-vent length 49.9, tail length 61.3, head length 12.0, head width 8.2, midbody diameter 8.2 mm. Dorsum black, liberally sprinkled with tiny golden dots; sides with a few scattered whitish spots and many gray, lichenous patches; dorsum of head with many tiny golden dots; tail with large whitish spots; venter slate with scattered white dots.

DISCUSSION. The most conspicuous diagnostic feature of the new subspecies is the metallic golden color of the dorsal dots; in other forms of **Plethodon glutinosus** the dorsal spots are whitish, silvery, cream, or light gray, without metallic luster. In **P. g. grobmani**, the dorsal dots are tiny, mostly .3 to .8 mm in diameter; these dots are decidedly larger in other forms of **P. glutinosus.** In **P. g. grobmani** the lateral spots are large, lichenous, dull white or gray, and usually in poor contrast with the ground color; in other forms of **P. glutinosus** the lateral spots are usually smaller, infrequently lichenous, generally white, silvery, or cream, and in fair or sharp contrast with the ground color. Unfortunately, the color characters of slimy salamanders are rapidly lost in preservatives.

In 8 specimens of the new form, the costal groove count was 14; 16 specimens displayed 14 grooves and a space for a 15th (axillary) groove which was, however, not developed; 3 specimens displayed 14 costal grooves and an indistinct 15th one; 2 displayed 15 grooves; and 6 displayed 15 grooves and an indistinct 16th one. In more northerly populations of **P. glutinosus**, the costal groove count is usually 16, rarely falling as low as 14.

In the 20 largest specimens of **P. g. grobmani**, the snout-vent length averages 53.7 mm, as compared with 60 to 64 mm in many series of large adults from the uplands of Georgia and the Carolinas.

About 25% of the **P. g. grobmani** specimens have a few scattered white dots on the venter, a character not noted in the more northerly populations of slimy salamanders.

DISTRIBUTION. The junior author has collected **P. g. grobmani** in Jenkins, Bullock, Berrien, Charlton, Brantley, Bryan, and Glynn counties, in the lower Coastal Plain of Georgia; material from these areas is not available at present, however. Grobman (1944: 281) mentions slimy salamanders taken one mile south of Kingsland, Camden County, Georgia, which displayed "golden spots on the dorsum and lacked the dorsal white markings in life," and accurately surmises that this "may be the conditions of **glutinosus** in the low Coastal Plain of southeastern Georgia and adjacent northeastern Florida." Florida records from Clay, Alachua, Hillsborough, and Pinellas counties are doubtless referable to **P. g. grobmani** (Carr, 1940: 47).

During the preparation of an account of the herpetology of Georgia, the junior author examined slimy salamanders from Dade, Walker, Floyd, Gilmer, Union, Rabun, Habersham, Stephens, Franklin, Gordon, Pickens, Cherokee, Fulton, Dekalb, Gwinnett, Hall, Jackson, Barrow, Clarke, Oconee, Oglethorpe, Madison, Wilkes, Lincoln, Taliaferro, McDuffie, Columbia, Bibb, Lamar, Macon, Richmond, Burke, and Randolph counties; none of these specimens duplicated the diagnostic features of **P. g. grobmani**. Specimens were also examined from Jasper, Beaufort, Hampton, Allendale, Colleton, Dorchester, Barnwell, Berkeley, Georgetown, Orangeburg, Aiken, Edgefield, and McCormick counties, South Carolina; populations from these areas also were found to differ from **P. g. grobmani.**

Apparently, then, the new form ranges from northern Emanuel and Screven counties, in the Georgia Coastal Plain, southward to Pinellas and Hillsborough counties, Florida, eastward to the Savannah River in Georgia, and westward approximately to the eastern border of the Dougherty Plain in Georgia.

INTERGRADATION. **Plethodon g. grobmani** is in contact with several populations of slimy salamanders which differ **inter se**. The junior author has ppreviously pointed out that extreme southern South Carolina is inhabited by a form of **glutinosus** that is aberrant in coloration, morphology, habits, and choice of habitat (Neill, 1948: 247). Apparently the lower course of the Savannah River, with its extensive marshes and tidal fluctuations, constitutes a barrier between **grobmani** and the aberrant South Carolina form. Slimy salamanders from the greater part of Burke, Jefferson, Washington, Glascock, and Richmond counties, Georgia (in the upper Coastal Plain just north of the range of **P. g. grobmani**), are characterized by very extensive white or cream mottling on the sides; in some

specimens the black is restricted to narrow mid-dorsal and mid-ventral areas. These heavily mottled specimens are quite long and slender, and the costal grooves number 16. In the Piedmont and in the relatively high western portion of the Georgia Coastal Plain, the slimy salamanders are similar to the **glutinosus** of the northern United States.

Two slimy salamanders were collected at Torreya State Park, Liberty County, Florida, on September 21, 1949. In these specimens, the dorsal dots were a bit larger than in **P. g. grobmani**, and only slightly metallic in hue. The lateral spots were more distinct, rounded, and whitish than in **grobmani**, but less so than in typical **glutinosus**. The costal groove count was 14 in both specimens. These two examples are considered to be intergrades.

Four slimy salamanders, similar to the Torreya Park specimens in color, were taken near Scott's Ferry, Calhoun County, Florida, on October 8, 1949. Three of these specimens displayed 15 costal grooves and a space for a 16th one; one displayed 16 distinct grooves. One was larger than the largest **grobmani**. These examples are also taken to indicate intergradation between **grobmani** and a more northerly form of **glutinosus.**

Seven intergradient specimens, similar to the above in color but with more heavily mottled sides, were collected 11 miles west of Waynesboro, Burke County, Georgia, on September 5, 1949. In these the costal grooves numbered 15 or 16. The series is apparently intermediate between **grobmani** and the heavily mottled **glutinosus** of the upper Coastal Plain.

Literature Cited

Carr, Archie F. Jr. 1940. A contribution to the herpetology of Florida. Univ. Fla. Pub. III (1): 1-118.

Grobman, Arnold B. 1944. The distribution of the salamanders of the genus **Plethodon** in eastern United States and Canada. Ann. N. Y. Acad. Sci. XLV (7): 261-316, figs. 1-11.

Neill, Wilfred T. 1948. An unusual variant of **Plethodon glutinosus** in South Carolina. Copeia 4: 247-251, 1 fig.

Head Bobbing, A Widespread Habit of Snakes*

By Wilfred T. Neill

From 1932 through 1938 I maintained a collection of living reptiles of many kinds, both native and exotic. A frequently observed habit of many captive snakes was a repeated upward jerking or bobbing motion of the head. This habit has been infrequently mentioned in literature, although it must surely be well known to reptile house attendants, vivarium keepers, etc.

The motion, as stated above, is a sort of bobbing one involving the head and neck, usually being repeated rapidly 5 or 6 times. It is particularly noticeable in breeding specimens as a prelude to copulation. Mansueti has described something of this sort in **Elaphe o. obsoleta** (1946, Herpetologica 3, part 3: 98). The movement is also frequently manifested when several snakes are together. It is often evident upon the introduction of a wild snake into a cage of several "tame" ones, the latter beginning the bobbing actions upon contact with the new arrival. The spasmodic motions are seldom repeated more than a few times under such circumstances, and no apparent response is evoked from the newly introduced animal, which generally dashes about the cage in an effort to escape. When one specimen in a cage of quiescent examples begins to crawl about over the others, they often "bob" a few times.

The response may also be produced by the introduction of snakes of other species, but is usually less pronounced under such conditions. It may be called forth by the presence of any moving creature or object until identification of that object has been made. Corrington accurately described the habit in **Elaphe guttata**, and concluded that it was a method of intimidation peculiar to that species (1929, Copeia 172: 72). I have occasionally stimulated snakes to this response by pounding lightly and rapidly on the floor of the cage; this was effective only

*Read at the meeting of the Pacific Division of the A. A. A. S. at the U. of Cal., June 22, 1948.

when the snakes had been "bobbing" a few minutes before, however. It seems to me, upon recollection, that the motion was most frequently exhibited by specimens in cages that were exposed to direct sunlight. This may have been coincidental, however.

The foregoing remarks are applicable to **Natrix e. erythrogaster**, **N. sipedon pleuralis**, and **Agkistrodon p. piscivorus**. "Bobbing" was also noted in **Elaphe o. obsoleta**, **E. guttata**, and **Constrictor constrictor imperator.** Actually it was observed in many other forms as well, but my notes are not specific as to which, and I hesitate to rely on memory when so many species were under observation. I believe that the majority of North American snakes will be found to display the habit.

This bobbing motion is evidently a widespread and well-defined behavior pattern of snakes, in response to certain definite stimuli. It is apparently connected with courtship and with the recognition of individuals, and is thus reminiscent of the bobbing or nodding movements characteristic of iguanid lizards. In snakes generally, the bobbing motion does not seem to be confined to the males, as is said to be the case with certain lizards.

Increased Rate of Ecdysis in Injured Snakes*

By Wilfred T. Neill

Recently a good many observations have appeared in the literature on the rate of ecdysis in snakes, the findings usually being based on healthy captive specimens under uniform conditions. Under such circumstances, many of the larger species apparently slough the epidermis at nearly the same rate, approximately once every month and a half.

Between 1932 and 1938 I maintained a collection of snakes of many species, and noted on several occasions that the presence of superficial injuries, particularly about the head and neck, resulted in an increased rate of ecdysis for the injured specimen. By far the most remarkable instance of this nature was the case of an 80-inch indigo snake (**Drymarchon corais couperi**) from southern Florida. The specimen, when received from a commercial dealer, was in splendid condition save for the presence of a deep gash on the left side of the head, extending from the posterior part of the parietal to the supraocular, thence downward across the eye to involve a supralabial and an infralabial. The injury was obviously of recent origin, and was still bleeding slightly. The eye was suffused with blood but was still functional. The snake was placed, untreated, in a roomy cage along with several coachwhips (**Masticophis f. flagellum**). The following day, the injured eye became opaque, the spectacle developing a cornified appearance. The eye was no longer useful, and the snake was observed to crawl with the head twisted through an arc of almost 90 degrees, so that the functional right eye was brought uppermost. Ecdysis took place 28 days after the specimen had been received. The skin was cast with no difficulty, except for the spectacle of the injured eye, which remained in place.

A second slough was cast only 27 days thereafter, the spectacle again proving refractory. To my surprise, a third ecdysis occurred only 17 days later. The skin was cast entire, and with it came the old spectacles that had accumulated. With each moult the cut appeared shallower and less serious, as though the snake were shedding away the injury, so to speak. The edges of the wound still gaped, and the injury was being healed from the bottom by the development of new under-lying tissue. After the third moult, the eye exhibited a translucency and the pupil could be discerned. Amazingly, only 18 days elapsed before the epidermis was shed for the fourth time. With this moult the eye became functional, although it was much bloodshot and the spectacle had a dent in it. The position of the head returned to normal. Throughout all this time the snake had remained more or less quiescent, eating nothing, but drinking a little water occasionally.

Just 23 days later the skin was shed for the fifth time, and the snake appeared to be practically normal. Scarcely an hour after shedding, it killed and swallowed the largest coachwhip in its cage, and remained for about 24 hours with the coachwhip's tail protruding from its mouth. The prey was then disgorged, digested to a remarkable degree. The other coachwhips were removed, and the indigo snake accepted a large bull-frog (**Rana catesbeiana**). Thereafter the snake

*Read at the meeting of the Pacific Division of the A. A. A. S. at the U. of Cal., June 22, 1948.

fed readily, shedding 3 times at intervals of 31, 27, and 28 days, respectively, at the end of which period my observations were terminated.

A normal rate of ecdysis of once every 2 to 3 months has been reported for the form (Stabler, 1939, Copeia 4: 227; Carson, 1945, Copeia 4: 222).

A large red-bellied water snake (**Natrix e. erythrogaster**), with an inch-long gash on the neck, shed 5 times at intervals of 19 to 26 days, and thereafter shed at the more usual rate of once every 35 to 45 days. A similar circumstance was noted in a specimen of **N. sipedon fasciata.** However, another example of **N. s. fasciata**, and also one of **Agkistrodon p. piscivorus**, both with cuts on the posterior part of the body, displayed no increase in the rate of ecdysis. Whether this was due to the position of the cut, its nature, or to some other factor could not be determined.

One would naturally suspect that the reactions involved in increasing the rate of ecdysis are initiated by chemicals liberated into the blood by the injured cells. Whatever its physiology, the process seems to be of definite therapeutic value in the removal of injured or necrotic tissue.

—The Reptile Institute, Silver Springs, Florida.

★ ★ ★

Handbook of Biological Data

The American Institute of Biological Sciences, under the National Research Council, has appointed a Committee on Handbook of Biological Data. The book is to be similar to present "handbooks" on Physics, Chemistry, etc.

The Herpetologists League has been asked by Dr. Errett C. Albritton, Executive Secretary of the Committee on the Handbook, to contribute qualitative and quantitative matter that can be expressed in tabular form with text reduced to brief footnotes.

The information is for use of investigators, teachers, and university classes. Preferably, the material should "tie in" with other branches of biology.

If any of our Members has suitable material, please contact your Editor, or write to Dr. Albritton, 2101 Constitution Ave., Washington 25, D. C., mentioning Herpetologica and the Herpetologists League.—Editor.

★ ★ ★

Exchanges

The following Members wish to exchange specimens or literature.

Mr. Arthur Carmichael, 1327—35th St. S., St. Petersburg, Fla.
Dr. Donald Daleske, 1434 N. Long Ave., Chicago 51, Ill.
Mr. E. R. Parizy, 10 Rue d'Avron, Gagny, S. & O., France.

★ ★ ★

THE SOCIETY FOR THE BIBLIOGRAPHY OF NATURAL HISTORY, founded in 1936 for the study of the bibliography of **all** branches of Natural History, publishes a journal of the same title, containing lists of published bibliographical papers and facsimile reproductions of rare pamphlets. Membership and the Journal, $4.25 per year. Complete set to date, $40.50; 20% discount to Members. This journal is of value to advanced students. Address A. C. Townsend, Secy., c/o Br. Mus. (N. H.), Cromwell Rd., London S. W. 7. (Above prices quoted prior to the British currency valuation. Present prices not available.)

★ ★ ★

THE AMERICAN DOCUMENTATION INSTITUTE offers perpetuation for long papers containing tabular matter and illustrations which cannot be published in standard journals.

1. The author sends the MS and an abstract to Editor, HERPETOLOGICA.
2. The Editor sends the MS to the A. D. I. where a catalogue number is assigned to it.
3. The abstract and catalogue number are published in HERPETOLOGICA.
4. The title of the MS with its Number will appear in the next succeeding Catalogue of the A. D. I.
5. Interested persons may thereafter obtain photostats or microfilm of the MS at a nominal cost from the American Documentation Institute, Science Service Bldg., 1719 N St. N.W., Washington 6, D. C.

At our request the Catalogue will hereafter contain a heading "Herpetology" and HERPETOLOGICA will be listed as a "Participating Journal."

Effects of DDT-Oil Solutions Upon Amphibians and Reptiles

By Earl S. Herald

A recent article in this journal (Munro, 1949 Herpetologica, 5:71) concerning the effect of DDT powder on small Cottonmouths has suggested to the writer that it would be of interest to herpetologists to have the results of early Air Force tests on the toxicity of DDT sprays upon amphibians and reptiles. Reports of this work have previously appeared only in declassified military publications of very limited distribution.

The toxic effect of DDT sprays upon cold-blooded vertebrates was quickly evident soon after the first field tests were initiated in 1943 by the Orlando, Florida, laboratory of the Bureau of Entomology and Plant Quarantine (U. S. Department of Agriculture). The Orlando Air Base cooperated in many of the early spray tests, and as spray techniques were perfected, the Air Force found itself besieged by nature lovers throughout the country: "The indiscriminate use of DDT by the military forces is resulting in the loss of our wildlife." Naturally, the Pentagon was not impervious to such criticism and so in a short time the Orlando Air Base received a directive which required the testing of all military spray techniques as to their effect upon wildlife. The writer received this assignment. Since the time of these tests (1944), many agencies and individuals have studied the effects of DDT and related insecticides upon fishes and other vertebrates. Little emphasis has been placed upon studies of DDT effects on amphibians and reptiles so that the information contained in this report is still significant. The reader who desires detailed information should consult the original report (Herald, 1946, Inclosure 10 (172-215) of Army Air Forces Proving Ground Project 467CB725). For further reading, the recent studies of Logier are recommended (1949, Ontario Dept. of Lands and Forests, Biol. Bull., No. 2:49-56).

Before proceeding it would be well to describe an event which very early shocked the writer into the realization of the highly toxic nature of DDT. One afternoon an assistant, irked by flies in a reptile cage, mistakenly picked up a handsprayer containing a 5% DDT-kerosene solution. The contents of this sprayer were vigorously applied to the interior of the pen which contained a group of 21 snakes. These snakes included 4 cottonmouth moccasins (**Agkistrodon p. piscivorous**), 3 green water snakes (**Natrix c. cyclopion**), 2 banded water snakes (**Natrix sipedon pictiventris**), 3 coatchwhips (**Masticophys f. flagellum**), 6 blacksnakes (**Coluber c. constrictor**), 1 pine snake (**Pituophis melanoleucus mugitus**), and 2 king snakes (**Lampropeltis getulus floridana**). In the course of the treatment most of the snakes were liberally covered with the spray. The next morning the tremors of acute DDT poisoning were very apparent. Of the snakes listed, all except three large cottonmouths were dead within four days. All individuals exhibited the progressive paralysis behavior pattern so characteristic of DDT-poisoned animals. It is assumed that the survival of the cottonmouths was not due to their greater tolerance, but rather to their sheltered position in the cage at the time of the spraying.

The AAF Committee on Aerial Dispersal of Insecticides, of which the writer was a member, used several different swamp and jungle areas for testing the effectiveness of spray procedures. In each of these test areas there was obtained a small amount of wildlife toxicity data. This information still left unanswered questions. Consequently it was necessary to design a series of tests which, through careful laboratory and field work, would demonstrate just what would happen to a poikilothermous population of a semi-tropical area which was under aerial DDT treatment for malaria control.

When an animal is affected by spray treatment, it is the result of actual spray falling upon the organism, or falling upon a water or other surface with which the organism later comes into contact. A secondary, and not uncommon toxic effect, results from the ingestion of contaminated material. This contaminated material is often in the form of other animals which have been killed by DDT. These secondary effects may sometimes be observed in military mess halls where 10% DDT dust is being used for the control of cockroaches. If mice are present, many of them are usually killed as a result of this treatment. (As many as 30 DDT-killed mice have been recovered from a single mess hall). The mice lick themselves after having run through the dust, but what is more important, they feed upon the heavily DDT-contaminated cockroaches. A mess-hall mouse showing acute tremors as the result of feeding upon these contaminated cockroaches was

STATE BIOLOGICAL SURVEY APR 6 1954 MANHATTAN

placed in a cage with a 48-inch corn snake (**Elaphe g. guttata**). The snake quickly made a meal of the mouse but in a short time it developed the usual DDT-toxicity symptoms and five days after ingestion of the mouse it died. Here then was a three-phase toxicity pattern — i.e., DDT from cockroach to mouse, to snake.

A review of the DDT-toxicity behavior patterns of amphibians and reptiles is made before enumerating the results of the field tests.

Frogs and Toads: When these animals are affected by DDT they typically lose the ability to kick downward and although they may be able to move their legs without too much difficulty, the movement is mostly to the rear. Occasionally there will be some downward movement of the legs and a jump will occur but often (especially with frogs), this is a pivoting jump due to the fact that traction will be obtained by only one leg. The result is that the animal completes the jump facing backwards. During these tests jumping ability was used as an indication of DDT effects.

Tremors have been observed in several toads and in some frogs. Gasping has been observed in frogs but not in toads, although it probably occurs in these also. In one series of tests a number of **Bufo terrestris** were fed living flies heavily treated with DDT aerosol, but no symptoms developed.

Salamanders: Several types were in test areas during aerial treatment but none showed any symptoms when held for observation in the laboratory. No feeding experiments were conducted.

Snakes: These reptiles go through a very interesting set of reactions as the result of DDT poisoning. After spray treatment or ingestion of contaminated food, tremors usually develop quickly and are pronounced within 24 hours. In the acute stage the attacks may be so frequent that there will be only a short respite between them. On occasion the gasping reaction is very evident, during which, some snakes have been observed to bite themselves. As death approaches, the tremors may subside and gasping increase. In locomotion, when the animal is showing only slight symptoms, he will be able to progress by moving coils posteriorly to about the center of the body then dragging the posterior, paralyzed end of the body. With acute poisoning he may begin to move the anterior end and suddenly be seized by a tremor which causes a contraction of both the anterior and posterior ends of the body simultaneously. Thus the snake finds his body in a circle with the head near the tail. This reaction is most characteristic of acutely poisoned snakes which have been startled or have attempted to move quickly. If death is to occur, it will usually take place within one to three days after the snake receives the lethal dose of DDT.

Lizards: A series of **Anolis carolinensis** which were fed on living flies previously treated with a heavy DDT-aerosol, showed only a slight loss of coordination. No further tests or observations were made.

Turtles: The principal symptom observed in turtles fed DDT-treated food has been a general condition of lethargy. The will to retract the legs or head is lost and such is accomplished only after persistent prodding. If placed upon his back, the animal will remain in this position for many hours. In one Florida Cooter (**Pseudemys floridana peninsularis**) there was observed the familiar gasping reaction which is so common in other types of DDT-poisoned animals, but tremors were not observed. Hard-shell turtles are relatively immune to a light DDT spray treatment. The one soft-shell turtle (**Amyda ferox**) which was found dead in one of the test ponds probably died as a result of ingestion of contaminated food.

In malaria control of large areas by military aircraft, the U. S. Air Forces at the time of these tests were using mostly a 5% DDT-in-fuel-oil solution distributed in concentrations usually less than .6 lbs DDT per acre. At the present time aerial spray treatment for mosquitoes is usually less than .2 or .3 lbs of DDT per acre. It should be pointed out that although a plane is putting out a known amount of DDT, the amount recovered from the ground is considerably less. For example, in a calibration flight of C-47 equipment, the ship was distributing .3 lbs of DDT per acre, but a maximum of only 0.0004 lbs DDT was recovered from ground test slides placed next to a series of **Bufo terrestris** used in the calibration. This amount was sufficient to cause toxicity symptoms and subsequent death of the toads directly beneath the line of flight. The toads on either side of the line of flight were not affected.

As a careful test, four typical Florida open ponds were selected which had adequate populations of aquatic vertebrates. Each pond was treated differently, the first with 5% DDT in fuel oil at the rate of .3 lbs DDT per acre, and the second with the same solution at .6 lbs DDT per acre. For the third and fourth

ponds concentrated solutions were used, i. e., 20% solutions of DDT in Velsicol and fuel oil, the third pond with .3 lbs DDT per acre and the fourth with .6 lbs DDT. Hydrogen-filled weather baloons were used as flight markers so that the coverage by the C-47 spray plane was very accurate. The effect of winds and waves in piling up DDT-oil films in the downwind sections of the sprayed areas and the resultant effect upon aquatic vertebrates was well demonstrated by these tests. In all four ponds the prevailing winds were from the west towards the east, and correspondingly, without exception, the majority of dead animals, chiefly fishes, were recovered from the east sides of the ponds. Although no objective evidence is available, it is thought that the presence of heavy vegetation along some sections of the ponds lowered the probability of the fishes, amphibians, and reptiles receiving lethal doses of DDT.

As a result of the spray treatment, 18 snakes (9 **Natrix c. cyclopion**, 7 **Natrix sipedon pictiventris** and 2 **Thamnophis s. sirtalis**) were collected within the test area. Seven were found on the first day after treatment, 3 on the second day, 4 on the third day, 1 on the seventh day, 1 on the eleventh, 1 on the thirteenth, and the last on the twenty-fourth day. Thirteen were dead at the time of collection and 3 died later in the laboratory. One snake, apparently normal, was used in an immersion test near one of the ponds and was not subsequently found. One snake was forced to regurgitate its food and as a result recovered. Stomachs of 15 of the 18 snakes were examined. Six stomachs contained DDT-killed fishes which had presumably also resulted in the death of the snakes. Two stomachs contained small lizards and 6 were empty. Twelve of the 18 apparently died from the effects of immersion in the DDT-oil film.

Four of the eighteen affected snakes were returned to the laboratory for observation. All showed marked DDT tremors and three succumbed within four days after the spray treatment. One specimen was a 39-inch **Natrix c. cyclopion** which had just swallowed a DDT-killed 8-inch largemouth bass. Inasmuch as the snake was showing severe DDT tremors it was decided to see if he would recover if the fish were removed. Consequently the snake was manipulated and caused to regurgitate the fish. That afternoon he was tested for locomotion and that function was found to be totally impaired. This was accompanied with the usual symptoms of severe DDT poisoning. Gradually the symptoms subsided and on the fourth day after the spraying the snake was able to move 3 feet within 5 minutes. At the same time the yawning had been lost, the tremors were fewer and not as pronounced. By the eighth day no more symptoms were apparent although locomotion was not back to normal. On the tenth day this snake was lost in a laboratory accident.

On the morning after the spraying one of the field observers found a soft-shelled turtle (**Amyda ferox**) which was in the process of eating a DDT-killed bluegill. He reached over to pick up the turtle but the animal slipped from his grasp. On the eleventh day after the spraying a soft-shelled turtle of approximately the same size (10 inches) was found dead on the bank of this pond. The stomach and digestive tract were examined and found to be empty. It is suspected that the two observations were of the same turtle. No other turtles were found affected although pond No. 1 had a fair population of the common Florida cooter (**Pseudemys floridana peninsularis**).

The only other turtle found affected as the result of field tests in other areas was a female striped musk turtle (**Kinosternon b. baurii**). She was discovered on the first day after spray treatment in a section in which considerable fish mortality had occurred. She was definitely not normal and seemed to be in an anaesthetized condition, refusing to retract the head or legs, or make any attempt to get away, even when violently disturbed. Four days after the spray treatment she laid two eggs and seemed to be returning to normal behavior pattern.* One week after the spraying the behavior pattern was still subnormal but improvement was being made. At eleven days following treatment the eyes appeared considerably sunken and the movements weak. On the twelfth day she died. During this period all types of food were refused. It is suspected that the death of this female was due to the ingestion of DDT-killed animals, probably fishes.

No amphibians other than frogs were found in the test area. It is believed

*DDT poisoning often causes viviparous fishes such as the Poecilids to abort their young. The eggs, mentioned above, did not hatch during the following two and one half months.

that the first three ponds did not have very large frog populations for pond No. 1 yielded 2 leopard frogs (**Rana pipiens sphenocephala**); pond No. 2 only 1 leopard, and pond No. 3, 2 leopards; and in addition, 3 cricket frogs (**Acris gryllus**). Pond No. 4 yielded 7 times as many as the first 3 together, i. e., a total of 56, of which 25 were leopard frogs and 6 were southern bullfrogs (**Rana grylio**). Three frogs from pond No. 4 were returned to the laboratory for observation. Two of them, a leopard and a bullfrog, showed lack of coordination symptoms. The third, a green tree frog (**Hyla c. cinerea**) showed no symptoms although it was collected in an area in which many dead frogs were found. The bullfrog progressively lost more of his coordination ability until on the fourth day after the spraying, he succumbed. The leopard frog was a very interesting animal. When first brought into the laboratory, he often showed a hiding reaction whenever anyone approached the gallon bottle in which he was held — for then he would hump his back, pull his head down close to the bottom of the bottle and slide his forelegs up over his eyes. Three days after the spray treatment he was given his first jump test at which time he was able to move his legs but could not obtain adequate traction on the floor. Whenever he was able to obtain purchase on the floor, usually one leg would catch and not the other so that the jump would be askew and at the end of the jump he would be facing the starting position. By the sixth day after the treatment he had progressed from 12 to 18-inch jumps and fewer of the jumps were askew. Entire recovery was gained in 10 days. The green tree frog lived for five weeks in the laboratory and during that time showed no DDT symptoms. This may indicate, as was also shown by the C-47 calibration spray test with **Bufo terrestris**, that it takes considerable spray directly upon an amphibian to cause toxicity symptoms. Ranid frogs seem to receive their lethal dose of DDT through the skin as a result of immersion in the oil-coated surface film of water, whereas the Hyliid frogs, being of a type which often remains perched upon vegetation and does not jump in and out of the water as often as the others, would have less opportunity to receive a toxic dose of DDT.

—Steinhart Aquarium, Calif. Academy of Sciences, San Francisco, Calif.

★ ★ ★

Herpetology in Early New England

We find this amusing quotation in Life and Letters of John Winthrop, 1630-1649, Robert C. Winthrop, Boston, 1867, p. 377.

"It fell out, about the midst of his sermon, there came a snake into the seat, where many of the elders sate behind the preacher . . . Diverse of the elders shifted from it, but Mr. Thompson . . . trode upon the head of it . . . until it was killed . . . The serpent is the devil; the synod, the representative of the churches of Christ in New England. The devil had formerly and lately attempted their disturbance and dissolution; but their faith in the seed of the woman overcame him and crushed his head."

★ ★ ★

Volumes I., II., and III. Available in Microfilm

The American Documentation Institute will reproduce vols. I., II., and III. in microfilm provided your Secretary receives several orders. The cost will be 1c per page. Vol. I. contained 212 pages, Vol. II., 212 pages, and Vol. III., 232 pages. We have on hand a supply of printed "Index, v. I., II., and III.", which we will mail as a courtesy to those who order the microfilm.

★ ★ ★

Mr. George McCartney, Beechgrove, Kirkpatrick - Durham, By Castle - Douglas, Scotland, publishes an interesting catalog containing herpetological titles.

★ ★ ★

Errata

In A KEY TO THE SNAKES OF THE UNITED STATES, second edition, page 46, second alternative under No. 24 read **Lampropeltis doliata doliata** (Linne) and on page 47, first alternative under No. 27 read **Lampropeltis doliata triangulum** (Lacepede). The ranges under the names remain in the same place in the key. Also, page 9, the common names of **L. d. doliata** and **L. d. triangulum** should be reversed. My thanks to Dr. Coleman J. Goin for calling this to my attention. I would appreciate hearing of any other errors.—**C. B. Perkins, Zoological Society of San Diego, San Diego, California.**

Herpetological Notes for Ras Jiunri, Baluchistan*

By Clarence H. Shockley

Limited opportunities were presented to collect and observe the herpetofauna of the area while I was stationed at a remotely located airfield at Ras Jiunri Baluchistan, India (now Pakistan). Ras Jiunri, sometimes called Jiwani, is a small peninsular projection in the Arabian Sea at the extreme southwestern border of Baluchistan and about ten air-miles east of Iran.

The surrounding country is arid desert with rocky hills of limestone and shale, and sparsely vegetated except in the immediate vicinity of oases and along river banks.

As a basis for climatic comparisons, information derived from data for Yuma County, Arizona, as given in Yearbook of Agriculture (1941) are presented along with data from AAF weather station records at Ras Jiunri.

Locality	Mean Jan. temperature	Mean July temperature	Mean annual precipitation
Yuma County	51.4°	92.1°	5.16 inches
Ras Jiunri	65.0°	85.5°	6.5 inches

Seventy-five per cent of the annual rainfall at Ras Jiunri was concentrated in December through February. Mean monthly temperatures in excess of 80° F. were recorded from April through October. The proximity of the Arabian Sea undoubtedly ameliorates the climate, and heavy dews make more water available to desert fauna and flora than would be apparent from the precipitation data.

The small number of lizards listed do not represent the only species seen, but are the only species positively identified from field notes or from specimens preserved and returned to the United States. Additional or large specimens were not collected because of a shortage of preservative fluid and space. The snakes listed were the only species seen or caught with one exception—a small black and yellow ringed sea-snake was seen twice but escaped. Only one toad was seen, and it was not collected.

All observations and collections were made between the 9th of September and the 5th of November, 1945.

Crocodilus palustris Lesson. The marsh crocodile was found in some of the deeper pools of the Dasht River. In addition to several sight records, four fresh skins measuring from four to five and one-half feet in length were brought in by the Baluchis. The Dasht River is listed as the westward limit of distribution for the species by Smith (1931).

Alsophylax tuberculatus Blanford. This terrestial gecko was seen only at night. Specimens were quite active and difficult to catch even when partially blinded by flashlights. No specimens were kept.

Agama agilis Olivier. Two juveniles were collected and preserved. The head is chunky in appearance, with the snout short and strongly curved in profile. The upper head scales are unequal in size, smooth, and are generally larger on the base of the skull region rather than on the snout as described by Smith (1935). Lengths of the two specimens are 143 and 148 mm., and the snout to vent measurements are 52 and 55 mm. respectively. Both lizards were found in the open on a bare rock formation above the beach during the hottest part of the afternoon. They did not appear very alert in comparison with many other lizards seen, but were quite adept at dodging from one rock to another when chased.

Agama melanura (Blyth). Several of these lizards were seen, but only one was captured after considerable effort. It was retained alive for a time, but died under conditions not permitting preservation. It was a male with a patch of white callose preanal scales about five scales in diameter, and another patch about twice this size on the middle of the belly. The head and neck were light yellowish brown, the rest of the upper body shading into black; the belly, limbs, and underside of tail were pale brownish. The tail comprised about two-thirds of the total length of seventeen inches.

Acanthodactylus cantoris cantoris Gunther. This small but very agile lizard was abundant everywhere on the sand dunes of the coastal area. Individuals seldom strayed far from the mouths of burrows which entered almost every clump of a low brushy shrub which grew in the sand. Whether or not the lizards made the bur-

rows is not known. It was observed that the lizards took refuge in them only when hard pressed, preferring to interpose the vegetation between themselves and pursuer.

The specimen is apparently typical. The only variation is that the preserved specimen has six light stripes instead of four or five as described by Smith (1935). Since this is a half-grown individual, the difference may be one of age only.

Varanus monitor (Linnaeus). One juvenile specimen was collected. Two addtional specimens about eighteen inches in length were seen in the thorny brush fringing the sandy banks of the Dasht River. A few of the men at the field reported seeing large monitors about a yard in length in the rock and coquina areas near the beach. Tracks and body imprints indicative of specimens about this size were seen in the fine dust under ledges.

Ophiomorus blanfordi (Blanford). This burrowing skink, apparently plentiful if the number of burrows may be considered a reliable criterion, was very difficult to obtain. Seven specimens, five of them with broken tails, were finally brought in by Baluchis after personal collecting efforts had failed. The habitat is the sandy area along the coast, their burrows being most commonly seen radiating in all directions from the clumps of grass growing above the high tide zone.

The five lizards with broken tails were adults, the other two were juveniles. One juvenile died under conditions not permitting preservation, but the remaining six were returned alive to the United States. Two of them are still alive at the present time, over three and one-half years after capture.

The specimens conform to the description of the types with one minor variation, noted only on the preserved juvenile. This specimen lacks the brown dot in the center of each dorsal scale. This may be a case of individual variation or a character which changes with age. Snout to vent measurements of an average adult are 92 mm.; the tail is broken, but it is at least equal in length to the body in normal adults.

The collection of this species amounts essentially to a rediscovery, since it is apparently known from only two specimens collected by Major Mockler in 1879, somewhere in southern Persia or Baluchistan and probably near the coast. (Smith, 1935).

Coluber rhodorachis Jan. Two juveniles were found, both in army barracks. One was brought in dead and was preserved; the other one was retained alive for two months. It fed readily on small lizards, but was itself eaten by a saw-scale viper when the two were placed in the same cage. The preserved specimen is 400 mm in total length, and has 229 ventrals and 141 caudals. These two young racers were the only harmless snakes seen in the area.

Enhydrina schistosa (Daudin). This sea-snake was the most common snake of the area. Two adults were captured by a Baluchi fisherman in a cast net and given to me. They were kept in about six inches of sea water in an open-topped, five gallon gasoline can. One died a week after capture, but the other snake lived over a month in the can and was eventually released. Although both snakes frequently raised their heads and necks several inches above the surface of the water, at no time did either snake attempt an escape from the cramped quarters. When placed on land, they floundered aimlessly without any forward progress. Neither snake displayed any sign of irritation, even when picked up by the tail.

The head and a section of skin from the midbody region of one specimen were preserved. The snake measured three feet in length, had 55 rows of scales, and is apparently typical in all respects. Smith (1926) mentions the curious physiognomy of this species.

Bungarus caeruleus Schneider. A large specimen of the common krait was found crawling by a barracks in the neighboring RAF camp about two hours after sunset, and notification of its presence was received in time to capture it. It lived in captivity for ten months, half of which time was spent in the United States. The snake refused all food except other snakes, which were readily accepted. The same inoffensive attitude was exhibited by this specimen as has been described for kraits in general.

The male specimen agrees with descriptions of the typical form with only slight color variations. The typical krait is described as being black or bluish-black above with narrow white cross bars, and having the upper lip and lower parts white. The Ras Jiunri specimen is brownish-black above, shading into a chocolate brown on the sides; the cross bars and ventral surface are pale yellow (faded to

white in preservative), and the lips bright yellow. The total length is five feet two and three-quarter inches, and the tail is seven and one-eighth inches. There are 235 ventrals and 50 caudals. Smith (1943) records ventrals as 194-234, and caudals as 42-52 for this species. He further states that specimens are found up to five feet in length, but are rare.

The distribution map in the cited publication indicates the westernmost limit of the krait to extend only a few miles west into Baluchistan from the border of the Sind. The present collection record is a westward range extension of slightly over three hundred miles.

Echis carinatus Schneider. Two specimens of this very irritable little snake, commonly called saw-scale viper, were captured at night on the road. Both were brought back alive to the United States, where one lived for about two years and the other for two and one-half years. Their lengths were about eighteen inches each at time of capture. Both specimens agree with the typical description. The captivity observations will be the subject of a later paper.

Pseudocerastes persicus Dumeril and Bibron. Two specimens of this eye-horned viper were taken at night, one in the camp area and one on the side of a steep rocky hill. Both snakes were quite vicious and hissed with considerable force during and after capture. The volume of hissing might be favorably compared with that of members of our American genus **Pituophis.** These snakes were also returned safely to the United States, and one of them is still alive at the time of writing, over three and one-half years from date of capture. Length was about twenty-eight inches each at time of capture. Further notes on this species will be given in a later paper.

Chelonia mydas (Linnaeus). The green turtle was commonly seen along the coast. They were so numerous at one locality on the peninsula that the men named it the Turtle Cliff. From this vantage point one could often see as many as a dozen large turtles at a time floating or swimming just beyond the surf. Nocturnal egg-laying activities were evident from the numerous turtle tracks on the sandy beaches. From the air or a high cliff it appeared as though a number of caterpillar tractors had been running around on the beach. Many nests were found, although most had been robbed by foxes and hyenas. Man is apparently not an important enemy of turtles in this area, since the Baluchis denied using them or their eggs as food. The three specimens taken by us at night on the beaches for food were large females, with shell lengths of about three feet. Still larger ones were seen during the day in the water.

Local information on reptiles was not always reliable. Many Baluchis were not prone to distinguish one snake from another, and considered them all dangerous regardless of species. Some lizards were also placed in this category and carefully avoided.

It is believed that this area would offer many interesting possibilities for future collecting, since it is so remote from larger centers of civilization that practically no one has ever collected there. Properly equipped, a collector should be able to make an impressive collection, especially of lizards, and the amount of life history data available would be almost limitless. It will always be a matter of regret that both my stay at Ras Jiunri and my collecting facilities were so limited.

Literature cited

Smith, M. A.
1926. "Monograph of the Sea-Snakes (Hydrophiidae)". pp. xx + 130, figs. 1-35, pls. i-ii. Taylor and Francis, London.
1931. "The Fauna of British India. Reptilia and Amphibia. 1. Loricata, Testudines." pp. xxviii + 185, figs. 1-42, pls. i-ii, map. Taylor and Francis, London.
1935. "The Fauna of British India. Reptilia and Amphibia. 2. Sauria". pp. xiv + 440, figs. 1-94, pl. i, map. Taylor and Francis, London.
1943. "The Fauna of British India. Reptilia and Amphibia. 3. Serpentes." pp. xii + 583, figs 1-166, map. Taylor and Francis, London.
Yearbook of Agriculture. 1941. "Climate and Man". pp. xii + 1248. House Document No. 27. U. S. Government Printing Office, Washington, D. C.

Indiana University, Bloomington.

* Contribution No. 409 from the Dept. of Zoology, Indiana University.

New Members

Allen, Richard W., 1444 Goddard Ave., Louisville 4, Ky.
Bechtel, Bernard, 101 Park St., Belmont, Johnstown, Pa.
Brantlinger, Joe, Arizona State College, Tempe, Ariz.
Bullen, Frank, 22 Kirkham Lane, Blackburn, Lanc's, England.
Carmichael, Arthur, 1327 35th St. South, St. Petersburg, Fla.
Cassino, Herman E., The Naturalists' Directory, Salem, Mass.
Chase, Charles P., Chase Wild Animal Farm, Egypt, Mass.
Congdon, Mark H., Box 80, Charlottesville, Va.
Davis, Dr. Wm. B., Dept. Wildlife Management, Texas A. & M. College, College Station, Texas.
Davis, Wm. K., Box 695, San Marcos, Tex.
Daleske, Donald, 1434 N. Long Ave., Chicago 51, Ill.
Dammann, Arthur, Arizona State College, Tempe, Ariz.
Dressler, Joe, 118 Seventh Terrace, Egg Harbor, N. J.
Evans, S. W., 338 Cubero Pl., Santa Fe, N. M.
Falls, Charlie, 15 Day St., Norwood, Mass.
Flint, James E., 510 E. Seminary St., Greencastle, Ind.
Gillespie, Neal, 678 Sherwood Rd., N. E., Atlanta 5, Ga.
Goldschmidt, Harvey M., Station No. 1, Brigham Young U., Provo, Utah.
Harris, Wm. A., Box 2972, Tampa, Fla.
Haws, Kenneth, Arizona State College, Tempe, Ariz.
Henn, Roy, 1238 Avant Ave., San Antonio, Tex.
Hensley, M. Max, Fernow Hall, Cornell U., Ithaca, N. Y.
Hunt, Earl, 921 Main St., Racine, Wis.
Jacobson, Kenneth, 1334 Custer Ave., Billings, Mont.
Johnson, Wm. H., Arizona State College, Tempe, Ariz.
Kane, John V., 55 Riverside Dr., Binghamton, N. Y.
Knight, Major Maxwell, The Homestead, Park Rd., Camberley, Surrey, England.
Maxwell, Robert J., 1300 Myotte St., Hillside, N. J.
Mertens, Dr. Robert, Senckenberg Museum, Senckenberg Anlage 25, (16) Frankfurt a. M., Germany, U. S. A. Zone.
Miller, Jack A., Box 101, Gilson, Ill.
Miner, Ernest H., Jr., 3212 McKinney Ave., Dallas, Tex.
McConkey, Edwin H., Box 2417, University Station, Gainesville, Fla.
Palmer, Acil, Arizona State College, Tempe, Ariz.
Pettus, David, Arizona State College, Tempe, Ariz.
Piper, W. J., Everglades Reptile Gardens, Bonita Springs, Fla.
Quackenbush, Dean, Box 382, McPherson, Kan.
Reid, Jack, 106 Bank St., San Antonio, Tex.
Robinson, Wilburn, Arizona State College, Tempe, Ariz.
Roseman, Neal Ira, 889 E. 27th St., Hialeah, Fla.
Seaton, Frank H., 6015 Thorp St., Tampa 9, Fla., Secy. Hillsborough Co. Herp. Soc.,

Member since Oct., 1948. Name regrettably omitted through error.

Sellers, Don, R. 5, Box 154, Abilene, Tex.
Shackelford, James, Arizona State College, Tempe, Ariz.
Simmons, Edward McIlhenny, Avery Island, La.
Stokes, A. B., Route 10, Box 57, San Antonio, Tex.
Taylor, Bruce E., HM2, USN, West Annex Dispensary, USN Amph. Base, Little Creek, Va.
Vollbrecht, John L., St. Augustine, Fla.
Watson, Daniel M., 3733 Garfield St., Kansas City 3, Mo.
Webb, Robert G., Box 10, Wilson Center, Norman, Okla.
Weiss, Godfrey W., 204 Pleasant Ave., Hamburg, N. Y.
Young, John H., Arizona State College, Tempe, Ariz.

★ ★ ★

In Memoriam

Dr. Gayle B. Pickwell, born at Murdock, Nebraska, March 25, 1899. Died May 29, 1949, at San Jose, California.

Edward A. McIlhenny, died August 8, 1949, at Avery Island, La.

Hibernation, and the Effect of a Flood on *Holbrookia texana*

By L. W. Ramsey

For several years a population of **Holbrookia texana** (Troschel) has been known to exist at some points along the north bank of the Clear Fork of the Trinity River on the Edwards Ranch, just west of Ft. Worth, Texas. Observations were made upon this population during 1948 and until July 10, 1949.

The habitat of these lizards consisted of an abandoned gravel pit north of the river, two rocky areas in the river bed, the north bank of the river at both places, and a gravel bar farther downstream in the river bed. The gravel pit, normally dry except for one small permanent water hole, was about 400 to 500 yards long by not over 200 yards wide. It was almost bare of vegetation except for a growth of small willows and Johnson grass along the ridges of waste gravel which traversed it, and it was situated in the eastern part of a Johnson grass meadow. The southern end of the pit was about 150 yards north of the upstream river area, henceforth referred to as site No. 1, and the eastern edge was about 250 yards northwest of the second river area, which will be called site No. 2. A narrow strip of woodland separated the meadow from the two river sites, but the gravel bar area was separated from the meadow by about one-fourth mile of woodland. The south bank of the river was timbered to a width of at least one-fourth mile throughout the area.

Both sites No. 1 and No. 2 were bare, rocky, and situated so as to receive the rays of the sun for about seven hours of the day in the winter. Several strata of shale were exposed in the north bank at both places. The shale eroded rapidly and piles of it accumulated along the base of the bluff and on several ledges which were present. Spring rains usually caused the river to inundate all of the river areas, but the gravel pit was not flooded except at times of unusually heavy rainfall.

Evidently a breeding population of **Holbrookia texana** occupied the gravel pit area. For they were common in the pit throughout the period of activity during 1948 and the spring of 1949, and newly hatched young were numerous there by August 1, 1948. The young were not found elsewhere at that time. A newly hatched specimen measured 23.5 mm snout to vent and 49 mm total length. **Cnemidophorus g. gularis** were also common in the gravel pit, meadow, and along the river.

During the summer and fall of 1948, part of the gravel pit population evidently drifted into sites No. 1 and No. 2 on the river. For no **H. texana** were seen at those places during the spring and early summer, and there was no other known population from which they could have come. The few lizards seen on the gravel bar probably came from the same source. The wooded south bank of the river served as a barrier and helped to concentrate the lizards at the two sites. By September 26, they were numerous at sites No. 1 and No. 2, where they ranged over most of the river bed, which was dry. As the evidence below indicates, probably all of the **H. texana** in the river areas hibernated there. Here, if left unmolested, they probably would have remained to be driven out, drowned, or washed downstream by the spring floods. Evidently this cycle would be repeated each year, with possibly a good many of the hibernating lizards being drowned each spring.

On December 28, 1948, the writer, with the help of several members of the T. C. U. Herpetology Club, searched sites No. 1 and No. 2, and the gravel pit for hibernating lizards. A total of 30 specimens of **Holbrookia texana**, two **Cnemidophorus g. gularis**, and two **Sceloporus olivaceus** were found at the two river sites. No lizards were found in the gravel pit. Subsequent visits by the writer accounted for six additional hibernating **H. texana** and one more **Cnemidophorus g. gularis**, all found in the two river areas. Failure to find hibernating lizards in the gravel pit may be attributed in part to the fact that they were probably well scattered throughout that area. No concentration of them was ever observed there, as it was in the two river areas.

All except one of the **H. texana** were hibernating in the loose shale accumulation at the base of the river bank and on ledges. Many of them were barely covered; the maximum depth at which any were found was approximately six inches. In most cases they were simply raked out of the shale with a potato hook. None was found under rocks, although a few were found in the accumulation of shale around some of the rocks. Both sexes, adults, and young of the year were represented. The places at which the **H. texana** were found ranged from 3 feet to 9 feet above the normal water level of the river. The single specimen not

AGRICULTURE LIBRARY 6 1 MANHATTAN

found in shale was near the top of a small pile of sand. A juvenile **Cnemidophorus g. gularis** was found at the bottom of the pile. The other two **Cnemidophorus** and one **Sceloporus** were hibernating in sandy alluvium, about a foot below the surface and at a higher elevation than any of the **H. texana.** The remaining **Sceloporus** was in some leaves under a large rock about 4 feet above the normal water level of the river. All of the lizards except the **Sceloporus,** were inactive when found. The writer previously reported finding **H. texana** hibernating at site No. 2 (Herpetologica, vol. 4, page 223).

It would be interesting to discover whether these lizards are as careless in their hibernation in other areas, particularly where shale is absent. Apparently, a well stereotyped pattern is involved. The shale is a good insulator and a shallow depth seems to be sufficient to protect the lizards from freezing even in severe weather. For one specimen, buried to a depth of about three inches, was known to have survived a local temperature of zero degrees F.

After the most severe cold wave of the winter, the writer uncovered two **H. texana** that had previously been buried by him in the shale to a depth of approximately three inches. Both of them were covered with small red ants. One was dead, and there was evidence of damage by the ants at several places on its body and tail. The other lizard was alive, but completely inactive. It was freed of the ants and kept under observation for about two weeks. No ill effects were observed. Evidently the ants had just begun their attack on it. No other case of predation by ants was noted, and it seems significant that this attack occurred at a time when the lizards were most helpless because of the cold.

On February17, 1949, after a period of heavy rainfall, a search was made at site No. 1 for 15 marked lizards that been left there eleven days earlier. Five were recovered and three unmarked ones were found. The day was warm and some of the lizards were fairly active. Much of the shale was wet from the rains, but the lizards were found only in the drier patches of it. The situation in which the marked lizards had originally been placed was quite wet and only two lizards remained in it. Evidently the others had left to seek drier quarters. All lizards found were left in the area.

The first spring flood completely submerged both hibernating sites. On March 6, after the flood, no lizards were found at either hibernating site and all of the loose shale had been swept away. Continued heavy rains kept the river flush and frequently at flood stage until May 29, 1949. The disastrous flood of May 17 inundated the entire area inhabited by these lizards, covering the meadow and gravel pit area to a depth of at least eight feet.

Seven weeks after this flood, the scarcity of lizards of any kind in the region was remarkable. No **Cnemidophorus g. gularis** were seen, but two **H. texana** were seen at widely separated sections of the meadow area, and one newly hatched young and one adult were found in the gravel bar area. The young specimen was captured and it measured 25 mm snout to vent and 52 mm total length. It evidently hatched from an egg laid in the area after the last flood waters had receded, that is after about June 1. The few surviving **H. texana** found are evidence that a flood of the magnitude of the one of May 17 may not destroy completely a population of these lizards.

—Fortworth, Texas

★ ★ ★

Special Offer to Classes in Herpetology

Dr. Herbert L. Stahnke, Director, Poisonous Animals Research Laboratory, Arizona State College, Tempe, Arizona, has subscribed for each member of his class. A special price can be arranged for class subscriptions provided the subscriptions start with the first issue of a volume.

★ ★ ★

Herpetology in the Near East

UNESCO recently published a bibliography of Near East science. Dr. Doris Cochran kindly looked this up and finds only one herp. title:

Muhtar Basoglu, On some varieties of **Viper berus** from the extreme northeastern Anatolia. Summary in Turkish. Revue de la Faculte des Sciences de l'Universite d'Istambul. Serie B, (Turquie) v. 13, 1948:143-160.

CROTAPHYTUS AS AN INSECT COLLECTOR.—While collecting along the western slopes of the volcanic Stillwater Range, some six miles east of Stillwater, Nevada, I found several of this year's hatch (1949) of **Crotaphytus collaris baileyi** hunting up in the spinescent **Sarcobatus baileyi** and **Atriplex confertifolia** which form the low-bush cover for the footslopes. The specimens, averaging some three inches in length, were active in the heat of midday, and to one of them I owe the record of a very rare winged tettigoniid **(Orthoptera).** This insect, hitherto known only from northwestern Arizona and barely across the line into Nevada, has long been listed as one of the rarest of its group in North America, and its discovery as far north as central Nevada was a distinct and unexpected surprise. In all probability, I would have passed unknowingly by the solitary specimen of **Anoplodusa arizonensis** (Rehn) 1904 but for the "intervention" of a three-inch Collared lizard, which I stopped to watch in an Atriplex bush.

During the course of some five minutes observation, the lizard had gone rather carefully and quite deliberately over most of the bush except that portion farthest from me. I was near to leaving when the small lizard made a quick movement, and a large, yellow grasshopper-like orthopteran flew up from the spot and swept downwind some hundred feet before disapppearing in another bush. The lizard was momentarily forgotten in the ensuing events.

Although keeping my eyes on what I thought to be the exact spot-of-landing, I demolished the bush and several surrounding it without success, and was widening my efforts when I flushed the insect again, and caught it after a short flight.

I do not know what the tiny lizard would have done with such a big mouthful, since the tettigoniid was about the same size, but with its relatively powerful jaws, the lizard would have undoubtedly eventually made a meal of the insect. Significantly, two days and a night of searching in the same area failed to turn up a single additional specimen of Anoplodusa, so I am forced to give considerable credit to Crotaphytus as at least an auspicious agent in the field collecting of rare insects.

However, I would be mighty impatient with any Crotaphytus I caught making a meal of such priceless material (signed: an entomologist).—**Ira La Rivers, University of Nevada, Reno.**

BABY GARTERSNAKE VICTIM OF GARDEN SPIDER.—On the evening of August 24, 1949, at about 10:00 P. M., while I was collecting by use of a flashlight along the Paxico Road 6 miles west of Topeka, Shawnee County, Kansas, a baby red-sided gartersnake (**Thamnophis ordinatus parietalis**), 183 mm long was found in the web of a large garden spider (**Miranda aurantia**). The little snake was lifeless and most of the fluid had been pumped from its body. After removal of a cloud of white, silken thread, numerous feeding abrasions were evident, especially over the blood-tinged head and tail.—**Charles E. Burt, Quivira Specialties Company, Topeka, Kansas.**

★ ★ ★

Philip Henry Gosse

Philip Gosse was one of the more successful of those who sought to bring natural history to the public in the last century. After passing a childhood in England, his early interest in natural history was nurtured by clerking in a whaler's office in Newfoundland as a youth, then farming for a time in Canada. With only the scantiest literature available, it was necessary for him to go directly to the animals for information. In this school he developed the knack of careful observation and note taking, then principally on insects, which was later to serve him in lieu of a formal scientific education. After a try at teaching school in Alabama, Gosse returned to England, having spent eleven footloose years in the New World.

Then came the beginning of a literary career, with the **Canadian Naturalist** the most notable effort of this period. The young man had now reached his thirties, and was characterized by extreme shyness and a rather warped personality which retarded his advance in scientific circles.

Gosse's big opportunity, and his only period of contribution to herpetology, came with a two-year visit to Jamaica, then but little known. From 1844 to 1846 he collected widely, and later described a number of new species of reptiles from that country. The result was a book, **A Naturalist's Sojourn in Jamaica**, which includes considerable natural history of reptiles and amphibians. There are observations on several species of geckos, anoles, and tree frogs, with chapters in

considerable detail on **Epicrates, Leimadophis, Typhlops, Ameiva** and others. There are many detailed color notes, especially of color changes in the anoles, and feeding habits receive considerable attention. Eggs and young are recorded for several species. The crocodile is very thoroughly described, and even some internal structures are considered. Certain of these accounts are of particular value, since the species have since become rare or extinct.

Following this period, a fascination for ocean life developed which was to absorb him for the rest of his life. He was the first to popularize the intertidal invertebrates, and a series of books on the subject made him much esteemed at the time.

Gosse was the son of a miniature painter, a fact which seems to be reflected in his meticulous artistry. He early began to sketch or paint the animals he studied, and continued this throughout his life, much of the work never having been published. The accompanying plate is testimony that his was no ordinary talent.

Gosse's Herpetological Bibliography

1848. On the habits of **Ameiva dorsalis**. Zool. Soc. of London. Proc. 16:24-27.
1848. On the habits of **Cyclura lophoma**, an iguaniform lizard. Zool. Soc. of London. Proc. 16:99-104.
1848. On the habits of **Mabouya agilis.** Zool. Soc. London. Proc. 16:59-62.
1850. Description of a new genus (**Placopsis**) and six new species of saurian reptiles. Ann. Nat. Hist. 6:344-348.
1850. Reptiles. Soc. Promotion of Christian Knowledge.
1851. A naturalist's sojourn in Jamaica. Longman, Brown, Green and Longmans.

—Keith Murray, MVZ, Berkeley, Calif.

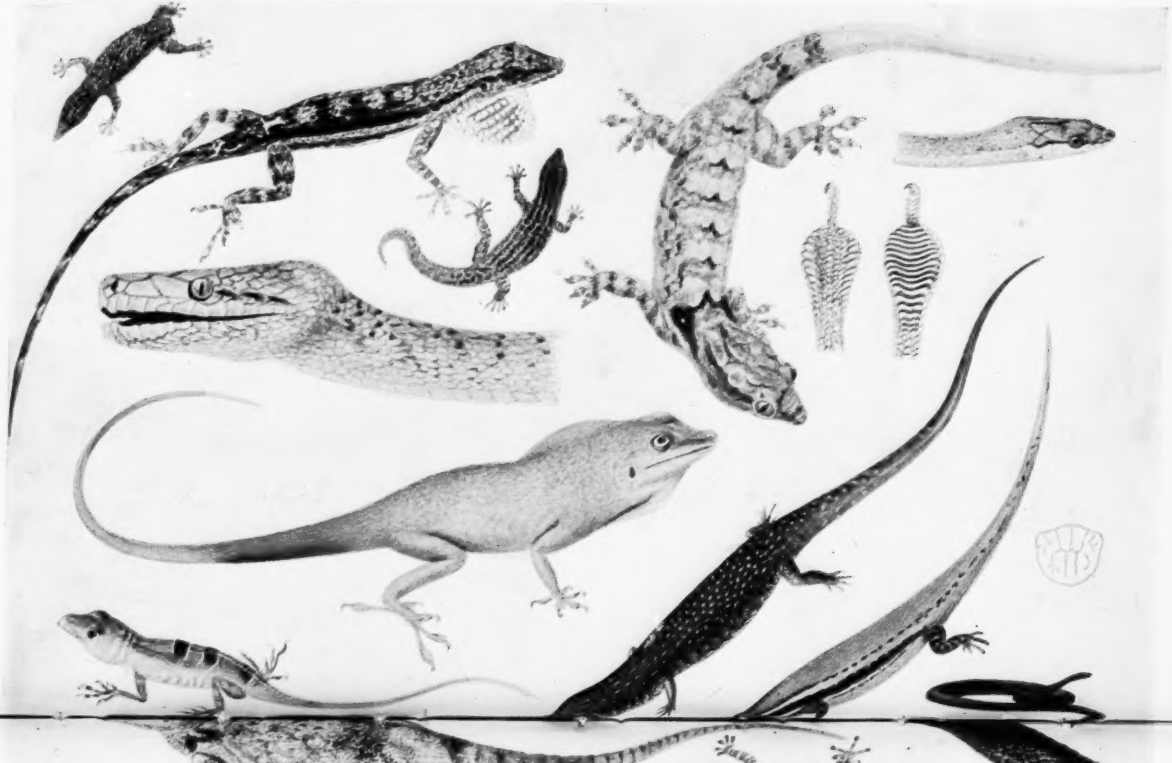
★ ★ ★

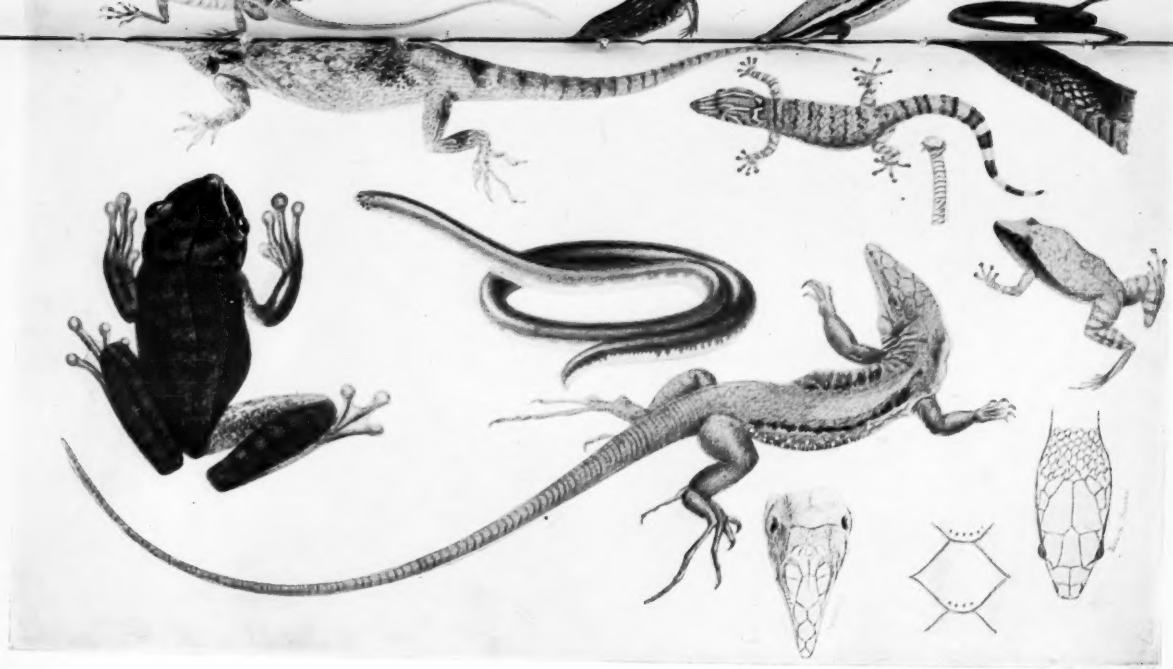
Gosse's Colored Plate

Permission to reproduce this plate was given by "Endeavour," 26 Dover St., London, W. 1. It appeared on p. 75, v. VIII., April, 1949. Mr. Philip Gosse, grandson of the artist, wrote that he was very much pleased by our publishing it. Identification of the figures by Chapman Grant.

Top row, left: **Sphaerodactylus goniorhynchus** Cope., tail broken.
Next fig.: **Anolis opalinus** Gosse, male, fan extended.
Central fig.: **Sphaerodactylus argus henriquesi** Grant.
Next fig.: **Aristelliger praesignis** (Hallowell), to the right, top and underside of toe showing lamellae.
Right fig.: **Dromicus callilaemus** (Gosse), head.
2nd row, left: **Epicrates subflavus** Stejneger, immature, lacking vivid coloring of adult.
Center: **Anolis grahami iodurus** Gosse, male, fan contracted.
Next fig.: **Celestus crusculus molesworthi** Grant.
Next fig.: **Mabuya spilonotus** Wiegmann, at right detail of a dorsal scale. See Grant, Scale structure in Jamaican lizards of the genus **Celestus**, Copeia: 109-111, illus., 1934.
3rd row: **Anolis l. lineatopus** Gray, female; the male is much larger, differently marked and known as the "zebra lizard."
Below: **Xiphocercus valenciennesii** (Dumeril and Bibron), for detailed peculiarities of head scales, see Grant, Symmetry and asymmetry of the median sutures in reptilian scutellation, Herpetologica, 99-109, illus., 1944.
Right: **Sphaerodactylus richardsoni** Gray, female; below, detail of toe.
Right: **Alsophis ater** (Gosse), head and sketch of coiled snake.
Bottom row: **Hyla septentrionalis brunnea** (Gosse), this species has a great range of colors and markings.
Right: **Typhlops jamaicensis** (Shaw), the pose shown by artist is improbable.
Right: **Ameiva dorsalis** Gray, detail of head below.
Right, upper: **Eleutherodactylus luteolus** (Gosse).
Right, lower: **Alsophis ater** (Gosse), head and detail of dorsal scales showing pits.

For further details see The herpetology of Jamaica, Lynn and Grant, The Inst. of Jamaica, Sci. ser. No. 1:1-48, 1940.





Reprinted from 'Endeavour' by THE KYNOCH PRESS, *Birmingham, England*

Food of *Heterodon nasicus nasicus*

By D. F. Munro

It is stated in Schmidt-Davis: **Field Book of Snakes of the United States and Canada**, p. 118, that "The food of **H. nasicus** is unknown."

A 23-inch female **Heterodon n. nasicus** was captured by D. H. Quackenbush near Roxbury, Kansas, on June 3, 1949. The snake was extremely timid: she gave up the characteristic defensive habits of the genus in a day or so, remained in concealment in the cage, and, when disturbed, hid her head under a loop of the body.

D. F. Munro

Remarkable, then, was the eagerness with which this snake ate toads, two inches or more in width when puffed up, on June 6, 11, and 18. She refused frogs. This readiness to eat toads must indicate that they are an important item of the natural diet of the species. The snake was found in a region abounding with toads.*

On June 23 the snake was given to the writer. She was then in the cloudiest stage preceding ecdysis, and obviously gravid. She cast a perfect slough on June 29 and laid 11 eggs on July 6.

The snake consistently refused small strips of beef, which are usually eaten even by recently captured Garters, Pilot Blacks, and Blue Racers. On July 9, however, she did not hesitate to take from the hand a freshly killed English Sparrow, and on July 17 she likewise accepted a large Short-tailed Shrew just killed by a cat; both bird and shrew were still warm.

On July 24 the snake quickly seized a fledgling Robin (dead some 15-20 minutes) which she swallowed with difficulty, it being fairly large for her, and already stiff. The wing joints had to be broken while the snake was struggling unsuccessfully to swallow, the bird's shoulders having lodged in the corners of her mouth. She apparently was not much alarmed by this helpful intervention.

Judging from the behavior of this snake, it seems safe to conclude that toads, birds, and small mammals are items of diet of **Heterodon nasicus nasicus.**

*Mr. C. B. Perkins states that **Heterodon n.**, taken in a frog area, refuses toads, and vice versa.

Gain in Size and Weight of *Heterodon* Eggs During Incubation

By D. F. Munro

On the night of July 5-6 the above-mentioned **Heterodon nasicus nasicus** laid eleven fairly uniform eggs, which had a smooth, soft, rubbery feel. They were deposited in a cloth sack, into which the snake had been put after dark when it seemed she might injure herself in her strenuous efforts to get out of the cage. The eggs were measured and weighed in random order upon discovery in the morning, divided into groups of 2, 3, 3, and 3, and set in large covered glass jars for hatching, following the damp-paper method recommended by Perkins (**Herp.** 4, 184).

The vessels were kept in an upstairs room, where the summer temperature prevailed except on the hottest days; then the room was held to about 90° with an evaporative cooler. The vessels were inspected daily. They were kept equally moist, so far as that was possible without instruments to check the humidity. Occasionally the lids were left off for brief periods.

On July 22 several of the eggs (Nos. 2, 3, 4, 5, 9, 11) had developed small dents on their upper surface: the paper medium had dried out too much. A few cubic centimeters of water were added to each container, and on the next day all the eggs were once more rotund.

Since it was apparent that they had increased in size, the eggs were cursorily weighed for the second time after four weeks, and again weighed and measured about two weeks later. The hatchlings began to perforate the shells on August 30 and started emerging two days later; they too were weighed, after shedding the skin (which was far less than 0.1 gm). The table gives the figures (dimensions in cm, weight in gm) to the nearest 0.1, except if just about 0.05.

Egg	July 6			Aug. 3	August 20			Snake	
No.	Length	Width	Wt.	Wt.	Wt.	Length	Width	Wt.	Date
1	3.4	2.0	6.6	9.3	9.4	3.35	2.4	5.9	Sept. 3
2	3.5	1.9	6.35	9.0	9.4	3.45	2.35	6.4	" 3
3	3.4	1.9	6.5	9.4	9.8	3.45	2.3	6.3	" 3
4	3.55	1.85	6.3	9.1	9.8	3.65	2.3	6.2	" 3
5	3.15	2.0	6.05	9.0	9.2	3.3	2.4	5.9	" 2
6	3.3	2.0	6.75	9.6	10.3	3.4	2.35	5.8	" 1
7	3.5	2.0	6.8	9.5	9.8	3.55	2.4	6.0	" 3
8	3.2	1.9	6.5	8.7	9.1	3.25	2.3	6.3	" 3
9	3.2	2.0	6.65	9.9	10.55	3.25	2.6	6.2	" 3
10	3.2	1.95	6.1	9.0	10.1	3.4	2.4	5.9	" 4
11	3.4	1.9	6.5	9.4	9.7	3.5	2.4	6.2	" 2

Length and width do not tell the whole story: some eggs were blunt and cylindrical, others having tapered ends; the weight depends on the shape (compare Nos. 6 and 7 on August 20).

The total weight of the eggs, 71.1 gm, was nearly three-quarters that of the seemingly somewhat dehydrated snake after laying them, 102.3. A few hours later, after drinking, she weighed 107.8, a figure almost reached by the eggs at their last weighing, when they totaled 107.15.

The eggs made their large gain in the first four weeks, increasing on the average over 43% in weight. The third weighing showed that some (Nos. 4, 6, 9, 10) had been a little slower in developing than the others: by this time the eggs had made a total increase of over 50% in weight. The gain was obvious to the eye: the eggs looked much fatter, the increase being not so much in length as in girth, as would be expected on purely mechanical grounds. Variations in gain among the eggs may have been due in part to small differences in their contact with moisture, some eggs lying deeper in the damp medium.

The partial desiccation indicated by the dents of July 22 evidently did no harm, for by August 20 one of the eggs which dented (No. 9) had made the second largest increase of all, being exceeded only by No. 10. The latter was a remarkable egg: it was originally the second lightest, but grew to be the third heaviest, thus making both the largest absolute gain as well as by far the largest relative one. Yet this big egg produced one of the smallest snakes!

Consideration of the statistics shows that there is no very good correlation between the initial and final weights of the egg and the weight of the issuing snakelet. In many cases the hatchling weighed almost as much as the egg first did; the weights are even more nearly equal if the value for the shell be subtracted—the dry shell is a little more than 0.1 gm. But the conspicuous exceptions (Nos. 1, 6, 7, 9) are enough to invalidate a generalization. Even so, however, it may be asserted that baby Hog-noseds are much heavier in relation to the egg than, say, Blue Racers, two of which, each weighing 4.8 gm, came from eggs initially 6.8 gm in weight.

Hatching of a Clutch of *Heterodon* Eggs

By D. F. Munro

The clutch of eleven **Heterodon nasicus nasicus** eggs described above began to hatch on August 30; by September 4 all the eggs had been vacated.

The first snakelet to break through the shell of its egg behaved as practically all its fellows did; a description of its activities, with additional comments on some of the others, will therefore give a general idea of the process.

When discovered at 7 A.M. the snakeling had already cut two short, parallel slits longitudinally on the upper side of the egg and was thrusting its snout through one of them. After getting the nose out, the little serpent remained in much the same position for hours. Its breathing, with a long interval after each cycle of exhalation and inhalation, was evidenced by the collapse and re-inflation of the very soft egg-shell. The thin-shelled egg no doubt makes it possible for Hog-noseds to escape by making only one or two small cuts, whereas other snakes, Blue Racers for instance, having an egg with a thicker, stiffer shell, must make several long slits, sometimes intersecting to form a narrow flap or lid.

The little snake enlarged the hole by pushing its head through. The head came out upside down, understandably enough, because the shape of the rostral scale had forced the snake to invert its head in order to bring the egg-tooth into play against the uppermost part of the shell. With head projecting in this manner, the body of the snake appeared to writhe and squirm inside the egg from time to time, as if disentangling itself or straightening out kinks. The snake may have been making efforts to right itself from the supine attitude.

During this phase of hatching the snakelet was not particularly timid, though the tongue flicked out nervously. When the egg, with head protruding upside down, was picked up and the mouth closely examined for the egg-tooth, the snake did not draw back into the egg until touched on the nose. Gentle squeezing or twisting of the egg-shell caused a similar withdrawal. This first egg was put in a separate vessel.

After resting, as it seemed, with head upside down for some hours, the snakelet gradually worked its head around to right side up. However, during the long time before final emergence, it often reverted to the upside-down position; when the head had been retracted for any reason, it was quite likely to come out again in the inverted position. Three hatchlings in particular favored this posture right up to final departure from the egg. They thrust their heads out an inch or two, lolling in helpless-looking attitudes, ventral side up. They looked dead.

After 55 hours of apparent indecision, the first snakeling had emerged and was found crawling about in its container, shedding fragments of its skin. It was dipped in water, whereupon the skin, except for the head scales, came off very easily as the little creature crawled through the fingers; dried, the snake was weighed and caged. Soon after, it shed its head scales and egg-tooth. Re-weighing showed no measurable loss of weight.

Meanwhile, most of the young had cut their apertures and were repeating the acts of the first one, with minor variations. It was a slow job. The clutch was inspected hourly or oftener during the daytime, and of course this activity may have caused delays, although the infants did not retreat into the interior unless actually disturbed physically (by moving the vessel or shifting the egg), and not always then. Blue Racers were found to come out within a few hours of breaking through the shell; but most of these Hog-noseds took two or three days (40-60 hours), much the shortest time being 30 hours by one individual only.

Moreover, to consider other possible inhibiting factors, the weather was rather cool during the first half of the six-day period in question, and that may have constituted a deterrent; it was noticed that many of the little snakes deserted their eggs about mid-afternoon, the warmest part of the day. However, three came out either late at night or in the very early morning.

Further, the unnatural environment (damp paper in glass containers) may have had some influence in retarding egress. To test whether the hatching reptiles would respond favorably to belated improvements in their situation, some fresh earth from under a boulder was carefully placed around a few of the eggs, some of which had started to hatch, others not. Likewise, exposure to direct daylight in the glass vessels might possibly have caused wariness, leading to delayed completion of hatching; therefore some crumpled soft paper was laid over certain eggs, of which some were already provided with soil. However, no evidence of more rapid emergence as a result of these elaborations could be detected.

An opened egg was, in most cases, removed from any of the original containers as soon as the latter held two perforated ones, in order that strict account be kept of which snake issued from which egg. The experience of being shifted did not have any apparent effect on the length of time of emerging.

Mindful of the lack of clear-cut, specific response to any of these varied circumstances, one could surmise that the infant snakes have to breathe air a long while before the final processes going on between egg and body are completed. When each hatchling was at last ready, it started definitely to move out, and after slowly inching forward an hour or so, it had left the egg. Those snakelets provided with soil did not burrow in it; there was a tendency on the part of some individuals to seek shelter under loose paper, but most of the little reptiles crawled about, making efforts to shed, until taken up for weighing.

The vacated eggs were found to be practically empty, except for fragments of skin around the escape hole of most of them. In one or two eggs there was a small amount of reddish gelatinous matter. Although most of the infants had lost parts of their skin in the egg, three of the young cast complete sloughs an hour or so after emerging.

The egg-tooth of each hatchling was observed with an eight-power glass and seen to be a tiny, forward-pointing, white, conical thorn on a small grayish mass filling the lingual groove of the rostral scale, apparently projecting from inside the mouth. The tooth was easily felt with the finger-tip. The rostral scales of almost all the babies were recovered, and although the tooth had disappeared about the time the rostral was shed, it was not found attached to the latter. The rostral scale of one individual came off during handling, but the egg-tooth remained in place; an hour later it was gone.

One snakelet which had not shed before emerging, and whose egg-tooth was clearly visible, was put in a small bare cage by itself. It rubbed its nose across the floor with a rooting movement, as if trying to loosen the skin for shedding. A moment later the snake was examined; the skin had not been loosened, but the tooth had disappeared. It could not be found in the cage. Search of the larger cage into which all the other young had been put did not yield anything that looked like an egg-tooth. Apparently it is swallowed after being loosened, sometimes before shedding of the skin, sometimes after.

None of the little Hog-noseds showed at first any sign of the bluffing and death-feigning behavior of the genus. After a day or so of crawling around, they would, if suddenly alarmed, utter a short hiss (more like a gasp) and recoil sharply, at times flattening the head and neck slightly. Two which tumbled into the water dish floated briefly in a tight loop, ventral side up, before scrambling out. Many tried to hide their heads under their bodies when the top of the cage was removed. Otherwise their actions did not differ from those of any sort of young snake, except possibly that they were more deliberate.

The little snakes averaged 6.1 gm and were about seven inches in length, stout and fat; of normal coloration, they were perfect miniatures of the mother, from the stubby tail to the sharply up-turned snout, as fully developed in the infants as in the adult.

—Kansas State College, Manhattan, Kansas.

★ ★ ★

Addresses Desired

Arthur O. Flechsig; John Landi; A. C. Reneau; Albert Schwartz; Robt. D. Vessels; Robert Wallace; Olin L. Webb.

★ ★ ★

Postage

Postage on vol. IV. came to $137, before rate increases! Please enclose stamped addressed envelope in correspondence and with MSS.

★ ★ ★

Fellows

The Officers of the Herpetologists League elected the following Members to Fellowship as of September 1, 1949, for having contributed significantly to the study of herpetology.

Mr. E. Ross Allen
Dr. Robert Mertens
Dr. Erna Mohr

★ ★ ★

Errata

The paper by Conant and Hudson on longevity records established at the Philadelphia Zoological Garden (**Herpetologica**, 5:1-8) contains a number of typographical errors. These have been called to the attention of the editor by the authors, neither of whom received proofs prior to publication. Regrettably, the typesetter removed the parentheses from around the names of all the authorities even though this type of punctuation should have been used in a very large number of cases to indicate that the generic name has been changed since the original description. Other important corrections are:

Page 4: Read **Kinosternon scorpioides** instead of **K. scorpiodes.**
Page 4: Read: **Macrochelys** for **Macochelys.**

—Roger Conant.

An Autumnal Concentration of *Ambystoma jeffersonianum*

By Richard A. Edgren

On September 12, 1946, while collecting in the area near Silver Lake, two miles southeast of Wautoma, Waushara County, Wisconsin, 33 Jefferson's salamanders were taken on the shore of Fish Lake. All of the specimens are quite small, sexually immature, and probably are recently metamorphosed young-of-the-year. They were found within 15 feet of the shore under small boards, logs, and debris, and were restricted to an area about 50 yards long on the southeast shore of the lake. Fish Lake is a small, permanent, heavily-weeded, shallow lake surrounded by the mixed deciduous-coniferous forests typical of the region. The trees grew to within 10 feet of the water line, and the remainder of the beach was heavily grown with rushes.

It is difficult to explain why the salamanders were congregated in this particular area. Suitable, in fact almost identical, locations were investigated up and down the shore from the area in which the animals were taken, but no salamanders were seen. Both adults and young were common in the surrounding woodland; a total of 11 others were taken in conventional habitats for the species.

For several days prior to the date of collection, temperatures had been unseasonably low, with night-time temperatures below freezing and day-time below 15 degrees C. Unfortunately, accurate or critical readings were not taken. It seems probable that the salamanders were actively metamorphosing in the lake at the time and were individually beginning their autumnal migration to the hibernal habitat niches in the near-by forest, but the sudden drop in temperature had driven them to whatever refuge was available in the immediate vicinity. Furthermore, it seems probable that these recently metamorphosed individuals are highly vulnerable to changes in environmental factors after having been adjusted to the relatively stable conditions extant in their parental ponds. According to Bishop (1941, p. 103) large numbers of young **A. jeffersonianum** aggregate "in October or November if the weather is mild . . ." and remain aggregated until cold weather forces them into hibernation. It is not implied here that these salamanders were aggregating. The small size of the individual groups of animals (no more than 7 were taken together), and the diffuse nature of the concentration, would make such a conclusion improbable, although the phenomena associated with aggregations may well have been operative in the individual groups.

Concentrations of this type are well known among insects. Park (1930) has described the annual migrations and aggregations of the Coccinellid **Ceratomegilla fusilabris** (Mulsant) and other beetles. During the warmer months these beetles are common throughout exposed areas in the Chicago region, but with the approach of winter the species is found more abundantly in sheltered areas. The large loose or "homodynamic" hibernation aggregations are formed by the crowding of late arrivals into already occupied niches. It seems highly probable that the extreme environmental conditions prevailing at the site of my observations drove the metamorphosing salamanders to available shelter, later individuals crowding together with the early arrivals. Unfortunately, however, simple crowding does not provide a complete explanation. Allee notes that (1927, p. 374) ". . . not all the apparently equally desirable space is occupied, so that the aggregation can not be entirely explained on the basis of unavoidable crowding." As noted above many apparently identical situations were available on immediately adjacent strips of beach, but these habitats were unoccupied.

About a year later, September 5, 1947, the same area was again investigated, but no **Ambystoma jeffersonianum** were found. That year temperatures were quite warm, day-time above 20 degrees and night about 15 degrees. It seems possible that the only variable involved was temperature.

Costal groove counts for the 33 specimens were quite stable, showing the following frequencies:

No. Grooves Left Side	Frequency	No. Grooves Right Side	Frequency
11	6	11	8
12	24	12	21
13	3	13	4

The means were 11.9 grooves on either side. Eleven specimens, or 33.3%, showed asymmetry in costal groove counts; of these, 6 or 54.5% showed a greater

number of grooves on the left, and 5, or 45.5%, showed the greater number on the right. In no case is there greater than one groove difference between the sides. If we include specimens taken in the neighboring woodland the means are increased to 12.0 on the left and 12.1 on the right. One of these latter specimens had a left side count of 14, and two others had right side counts of 14 and 15.

In snout-vent length, the specimens vary from 24.5 to 38.4 mm, with a mean of 30.8 mm, and in tail length they vary from 18.8 to 36.7 mm, with a mean of 25.9 mm. On an average specimen the tail would represent 45.7% of the total length. Measurements were taken from the anterior angle of the vent craniad to the snout and caudad to the tip of the tail.

A single female collected in the adjacent woods, measuring 99.5 mm, contains ovarian eggs some of which are as large as 1.5 mm. This specimen is somewhat smaller than one recorded by Bishop (loc. cit., p. 102) as the smallest egg-containing female. His specimen, collected in November, measured 112 mm, and contained eggs 1.7 mm in diameter.

I am indebted to Dr. Orlando Park for suggestions on the preparation of this note.

References

Allee, W. C. 1927. Animal aggregations. Quar. Rev. Biol., 2:367-398.

Bishop, S. C. 1941. The salamanders of New York. N. Y. State Mus. Bul., 324:1-365.

Park, Orlando. 1930. Studies in the ecology of forest Coleoptera. Seral and seasonal succession of Coleoptera in the Chicago area, with observations on certain phases of hibernation and aggregation. Ann. Entomological Soc. Amer., XXIII, 1:57-80.

—Department of Biological Sciences, Northwestern University, Evanston, Ill.

★ ★ ★

A KEY TO THE SNAKES OF THE UNITED STATES, 2nd edition, by C. B. Perkins, published by the Zoological Society of San Diego as Bulletin No. 24, is available at $1.00 per copy. The new edition has been brought up to date to include all taxonomic changes that have appeared since 1940, listing the currently recognized scientific names of the snakes of the United States. Inquiries should be addressed to the Zoological Society of San Diego, P. O. Box No. 551, San Diego 12, California.

★ ★ ★

THE HILLSBOROUGH COUNTY HERPETOLOGICAL SOCIETY of Tampa, Florida, with headquarters at 6015 Thorpe St., Tampa 9, Fla., was formed August, 1948, for the purpose of studying local herpetofauna. Moving pictures, colored slides and living and preserved specimens are shown at lectures. Members desire to exchange specimens. A non-profit organization. Frank H. Seaton, Secy.

★ ★ ★

THE WORCESTER COUNTY HERPETOLOGICAL SOCIETY was founded at the Worcester Museum of Natural History in 1856 by the Reverend Horace James, who continued an active program until 1876. At present, our Member, Frederick R. Chaffee, is Public Relations Consultant of the Society. Museum of Natural History, 12 State St., Worcester 8, Mass.

★ ★ ★

Meetings With the A. A. A. S.

The meeting of the Pacific Division of the A. A. A. S. was held at the University of British Columbia, Vancouver, June 13-18, 1949. Mr. C. B. Perkins of the San Diego Zoological Society furnished a fine representative collection of live desert snakes which your Secretary displayed at the meeting.

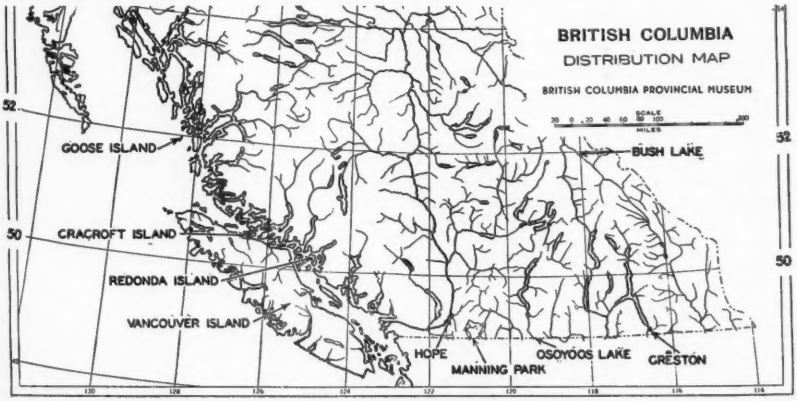
The next meeting of the Pacific Division will be held at the University of Utah, Salt Lake City, June 19-24, 1950. It is requested that any Member who expects to attend and read a paper notify the Secretary at his early convenience.

Extensions of Known Ranges of Some Amphibians in British Columbia

By G. Clifford Carl

The ranges of several Pacific Coast amphibians appear to have their northern limits within the Province of British Columbia. In fact, of the nineteen species found in British Columbia and southward, all but a few reach the most northern point of their range within this Province. The exceptions are the Pacific newt (**Triturus granulosus**), the Northwestern toad (**Bufo boreas**), the Spotted frog (**Rana pretiosa**) and possibly one or two others, all of which are found as far north as the Alaskan coast. While it is not intended to discuss factors which possibly limit distribution northward, it might be well to mention in passing that the length of season during which amphibians can remain active is probably the most influential factor in determining their range in this direction.

The fact that northern range limits occur here and that the precise limits of these ranges are as yet unknown add interest to most records of amphibians taken in this Province. The following records extend the known limits of range of six species.



Ambystoma gracile (Baird). Northwestern salamander. Goose Island, 23 miles west of the mainland coast at latitude 51:58:00 degrees north, July, 1948. Well-advanced larvae of this species were found in pools along the shore of a lagoon not far above high tide level. In some cases the larvae were either dead or dying, apparently as a result of increases in salinity of the water due to changes in seepage conditions. According to Dunn (Notes on the salamanders of the **Ambystoma gracile** group. Copeia, No. 3, pp. 129-130, 1944) these salamanders belong to the subspecies **A. gracile decorticatum.**

Ensatina eschscholtzi Gray. Red salamander. Redonda Island, at latitude 50:20 degrees north, off entrance to Toba Inlet, October 1, 1943, and March 20, 1945; collector, Mrs. G. Ballantyne. Hope, approximately 100 miles east of Vancouver on the Fraser River, October 15, 1947; collector, T. L. Thacker.

These records extend the known range of this species about 25 miles east of its former known limit of range near Chilliwack and indicate that its normal range will likely include other coastal islands between Vancouver Island and the mainland.

Aneides ferreus Cope. Clouded salamander. Cracroft Island at latitude 50:40 degrees north on the north side of Johnstone Straits, October 9, 1943, and October 25, 1944; collector, Mrs. H. C. Northcotte.

This species is also found on Vancouver Island and a few associated islands but has not yet been recorded from the mainland of British Columbia.

Ascaphus truei Stejneger. Tailed toad. Buckhorn Creek, tributary to

Similkameen River, 6000 feet elevation, Manning Park, August 1, 1945; Headwaters of Skagit River, Allison Pass, 4450 feet elevation, Manning Park, August 13, 1945.

The record for the Similkameen River system extends the known range of this amphibian to the eastern slope of the Coast Mountains in British Columbia.

Rana pipiens Schreber. Leopard frog. Osoyoos Lake, Okanagan system, July 1947, collector, J. D. Yarwood; Creston lakes, Columbia system, July 1948, collector, J. A. Munro; Bush Lake, 45 miles north of Golden, Columbia system, September 8, 1948, collector, D. A. Munro.

Since the only other record of the Leopard frog for the Province is from Loon Lake near the International Border, the above records extend the known range of this frog from Osoyoos Lake eastward to Creston and north about 190 miles to Bush Lake.

Rana clamitans Latreille. Green frog. Hope, August 25, 1949; collector Miss Margaret Thacker.

The Green frog is a non-native species which has been introduced through the pet-shop trade. It is now likely to be met with in areas in the vicinity of ornamental pools.

—Provincial Museum, Victoria, B. C.

★ ★ ★

Lampropeltis alterna from Pecos County, Texas

By John S. Mecham and William W. Milstead

Published records for **Lampropeltis alterna** (Brown) list the following Texas localities: Davis Mountains, Jeff Davis County—type locality (Brown, 1901); Chisos Mountains, Brewster County (Murray, 1939); and Sierra Vieja Mountains, Presidio County (Jameson and Flury, 1949). A recent collecting trip to West Texas by J. A. Herrmann and the writers yielded one specimen of **Lampropeltis alterna** from the Stockton Plateau in Pecos County, Texas, approximately 15 miles west of Bakersfield. The specimen was found DOR on U. S. Highway 290 about midnight on September 17, 1949.

Due to the few specimens of the species known, we deem it advisable to give the following description of the Pecos County specimen: the snake is a female, 773 mm in length; tail length 119.5 mm; head length 26.5 mm; ventrals 218; subcaudals 58; preoculars 1-1; postoculars 2-2; supralabials 7-7; infralabails 11-11; temporals 3-3-4 on both the left and right sides; DSC 25-25-21.

The dorsal coloration agrees in general with previous descriptions in that there are twenty black bands split by red alternating with fifteen narrower black bands on a ground color of slate gray, five scale rows in width, between the bands. The narrow black bands are absent between the fourth and fifth and the fourteenth and fifteenth wide bands, and are reduced to spots posterior to the fifteenth. The first black and red band on the neck is eleven scales wide at the mid-dorsal line, and the remaining nineteen are from 4 to 7 scales wide, broken intermittently by the ground color. The red coloration is limited to the dorsal scales and is not present on the lateral scales. There is no red in the last two bands on the tail. All of the bands are bordered with a narrow margin of white, one-half scale in width, as described by Jameson and Flury (1949) and as shown by Murray (1939) in his illustration. The black bands of the dorsum extend onto the edges of the ventral plates. The ventral plates are white, mottled with black.

This record extends the known range of **Lampropeltis alterna** eastward in Trans-Pecos Texas to the Stockton Plateau and indicates a wider distribution for the species than has been previously indicated. The remains of a **Sceloporus undulatus consobrinus** were contained in the stomach of the specimen. The snake is No. 7420 in the Texas Natural History Collection of the University of Texas.

Literature Cited

Brown, A. E. 1901. A new species of **Ophibolus** from western Texas. Proc. Acad. Nat. Sci. Philadelphia, 53:612-13.

Jameson, David L., and Flury, Alvin G. 1949. The reptiles and amphibians of the Sierra Vieja range of southwestern Texas. Tex. Journ. Sci., 1:54-77.

Murray, Leo T. 1939. Annotated list of amphibians and reptiles from the Chisos mountains. Contrib. Baylor Univ. Mus., No. 24:9-12.

—Department of Zoology, University of Texas, Austin, Texas

Boa Constrictor Eats Porcupine

By Bert Tschambers

The Central American Boa Constrictor, **Constrictor constrictor imperator** (Daudin), is one of the more common exotic snakes represented in zoological collections. In spite of this fact, there are many phases of its life history yet to be solved. Available literature reveals that in the wild state **imperator** feeds upon mammals, birds, and lizards. At the Lincoln Park Zoo, most specimens show a decided preference for birds.

In November, 1947, the Zoo received a specimen of **imperator** approximately six feet in length. The snake was collected near Balboa, Canal Zone, and arrived by air freight. It was placed in an isolated cage to undergo the check-up given all new arrivals to prevent the spread of ecto-parasites and contagious diseases.

Upon checking the Boa's mouth for signs of canker (infectious stomatitis), two quills were found measuring about an inch in length. The points were deeply imbedded at an angle in the roof of the mouth. The quills folded against the roof of the mouth when closed. The surrounding tissue was highly inflamed and infection was beginning to develop. The quills were extracted, and the area medicated to prevent further infection.

The following day, a mass of long reddish hair, and six or seven claws, were passed in the feces. Since no more quills or claws were found, the snake had undoubtedly had a previous passage before shipment to us. It is not at all unusual for snakes to have more than one evacuation after a large meal. The hair, claws, and quills were sent to the mammal department of the Chicago Natural History Museum, where, through the kindness of Dr. Philip Hershkovitz, the material was identified as belonging to a juvenile example of the prehensile-tailed porcupine, **Coendou rothchildi.**

It is rather difficult to conceive just how such a rodent endowed with an armour of sharp quills could be overpowered and eaten. The snake showed no external marks or ill effects from the quills due to constriction, provided that constriction had been employed in the capture and subdual of the porcupine. This particular genus of porcupine is noted for its quills which are sometimes more or less concealed by long hairs and for the prehensile power of its long tail. Like other tree porcupines, it feeds by night and sleeps by day.

In zoos, newly acquired specimens of exotic snakes sometimes present a problem since the feeding habits and food selection in the wild state may not be known. Since many zoos have specimens flown in by air express, an examination of the feces of such new arrivals will sometimes aid in determining its future captive diet.

Lincoln Park Zoo, Chicago, Ill.

Birth of the Australian Blue-Tongued Lizard, *Tiligua scincoides* (Shaw)

By Bert Tschambers

Edgar Waite says in his "Reptiles and Amphibians of South Australia" (1929:144) that **Tiliqua scincoides** is viviparous and produces from 10 to 15 young but the size of the mother and the young and their number is not given. He states that 23 inches is the maximum length. G. Longly (Proc. Royal Soc. New South Wales, 1938-1939:39-42) records litters of 10, 14, and 18. The litter of 18 measured 4½ to 5 inches long. The average length for the litter of 10 is given as 4½ inches. No size of the adults is given.

Six specimens of **Tiliqua scincoides** were received at the Lincoln Park Zoo in Chicago, in November 1948, two of which were gravid. One was placed in an exhibition cage, while the others were placed in a large spare cage with four Australian Spiny-Tailed Skinks, **Egernia cunninghami.**

Female number one was observed to snap at and bite a male as it attempted copulation. The male lost about three inches of its tail which was bitten off and consumed by the female. Following this the male was removed. At 9:00 A. M. January 15, 1949, the female gave birth to a young lizard. One of the Spiny-Tailed Skinks rushed over and grabbed it and tried to swallow it. The young was taken away apparently uninjured. The mother was moved to another cage where the births occurred at 3:20, 3:27, 3:38, and 4:10 P. M., respectively.

Female number two assumed a peculiar position during parturition, the

back being arched about an inch. The anterior part of the body was supported by the front legs while the posterior part was supported by the end of the tail. The hind legs were held rigidly backwards and upwards close to the body which moved from side to side, the tail being used as a pivot. This lateral motion appeared to assist in the birth process. This position was held for about 20 seconds, 4 seconds of which were consumed in the actual delivery. After each birth, the female relaxed to her normal position and crawled to another part of the cage. Between births, she appeared restless, exhibiting rhythmical contractions of the body.

The young were presented tail and head first, the tail being folded tightly up against the body. From 6 to 8 seconds were required for the young to break through the egg membranes by wriggling. The tongue could be seen flicking in and out as the young moved about within the membranes. After rupturing the sac, the young worked its way out and in each case devoured its egg membrane. Then it began licking its legs, after which it became surprisingly active, running about the cage. When disturbed, they opened their mouths and stared at the source of disturbance, but they failed to bite when given the opportunity.

About an hour and a half after the last birth, the mother was given a raw egg. As she lapped the egg, several of the young also gathered about the shallow pan and began feeding. The young tilted their heads to one side as they watched the movements of mealworms which they eagerly ate.

The coloration of the young differed somewhat from that of the adults.

Adults	Young
1. Venter whitish, heavily tinged with pink.	1. Venter whitish only slightly tinged or devoid of pink.
2. Ground color of body and head light gray.	2. Ground color of body olive green, head slate gray.
3. Body bands black or dark brown, edged with 1 row of black scales.	3. Body bands bright reddish brown, edged with 1 row of black scales.
4. Tongue bright blue in color.	4. Tongue blackish blue in color.

Females	Tail Length mm	Total Length mm	Number of Tail Bands	Number of Body Bands
Number One	190	417	8	8
Number Two	223	456	9	5

Brood of Female No. 1

Body bands separated by 5 scale rows of ground color (av.). Bands 4 scales wide (av.).

	Weight gm	Tail Length mm	Total Length mm	Number of Tail Bands	Number of Body Bands
1	15.5	44	130	10	8
2	14.0	42	133	11	8
3	9.4	42	131	11	8
4	14.1	43	135	11	8
5	13.5	46	139	11	8

Brood of Female No. 2

Body bands separated by 2 scale rows of ground color (av.). Bands 6 scales wide (av.).

	Weight gm	Tail Length mm	Total Length mm	Number of Tail Bands	Number of Body Bands
1	16.5	45	140	10	5
2	15.0	44	146	9	6
3	15.3	46	130	9	5
4	15.0	50	152	10	6
5	15.5	51	151	11	6

—Lincoln Park Zoo, Chicago, Ill.

Notes on *Sceloporus undulatus tristichus* Cope

By Jack Dammann

In the plateau region just south of the south rim of the Grand Canyon of Arizona, I find these lizards very numerous.

On July 6th, a female in captivity laid eight eggs. When first observed at 7:30 p.m., she was approximately astraddle a small depression in the dirt and pine needles. She had already deposited four eggs. By 8:00 p. m., four more were deposited. The body of the lizard was in a normal position throughout the procedure, but the tail, close to the vent, was raised slightly and the hind legs were widely spread. As each egg emerged about half way, the female paused, it seemed, to rest and then by a convulsive twist from side to side of the pelvic and anterior tail region, the egg was forced out. For some moments after the last egg was deposited, the female seemed incapable of active movement and control of the hind legs.

When first deposited, the eggs were 9/16" long and 5/16" wide. They were soft, nonadherent and on one side were an opaque white, while the other was translucent pink and showed evidence of small blood vessels and a darker center. Soon after being deposited, the eggs took on a slightly wrinkled look and the shell seemed tougher although not brittle. One of the eggs at the time of emergence was badly wrinkled and had the appearance of being partially deflated. It was opened and there was yellow fluid, red blood vessels and a darker part which, under the glass, proved to be the embryo with the eye very well developed.

Several others, apparently healthy gravid females, died without laying their eggs. Some of these unlaid eggs were opened and found to be solidified.

On September 10th., a juvenile measured one-half inch from snout to vent, and showed the barest signs of blue ventral patches, while the rest of under surface was uniformly deep brown.

These lizards have been observed actively feeding from shortly after sunup until dark. As early as the first of May they were very numerous during the day although the temperature normally dropped below the freezing point at night. During May a large male was found at noon under a heavy rock and so torpid that it could barely move, although it's eyes were open and in a very few moments it was as active as any.

These lizards have been observed actively feeding from shortly after sunup after they have taken cover, under any available object or in small mammal holes.

Specimens in captivity will eat flies of all kinds, small black ants, spiders, small moths ,grasshoppers, leaf hoppers, etc. They, like many other lizards, refuse fuzzy caterpillars. They will dash and grab the caterpillar, then either because of the body juices or the fuzz of the caterpillar, it is rejected and the lizard wipes it's mouth on the ground with evident distaste.

They have been observed to shed the skin in July. On all young specimens observed, the whole skin was loosened, and shedding at one time (although not in one piece) while the adults shed small areas or single scales.

Although the normal habitat in this area is somewhat dry with usually no standing or running water available, they seem to appreciate water very much, and when in captivity will bask for hours in a dish of water.

—Phoenix, Arizona.

★ ★ ★

The Herpetologists League should be represented at the next National Meeting of the AAAS in Cleveland, late December, 1950. Any Member who can give a paper or help in arrangements please contact the Secretary of the H. L.

★ ★ ★

D.D.T. Kills Snakes

Hoffman, C. H., and J. P. Linduska. Some considerations of the biological effects of DDT., Sci. Monthly. **69**: 104-114, Aug., 1949. pp. 106-7. "In Texas an experimental attempt to control ticks with 44 pounds of 10 percent DDT dust per acre was suspected of having caused a heavy mortality of the insectivorous rough green snake."

AGRICULTURE LIBRARY MAY 6 19 MANHATTAN KANSAS

BIRTH OF 18 YOUNG **PHRYNOSOMA DOUGLASSII HERNANDESI** (GIRARD)—During the first part of July 1946 a gravid female Horned Lizard was collected at Tusayan, six miles south of Grand Canyon Village, Arizona. She was confined in an outdoor enclosure along with several other lizards. On July 20, at 11 A. M., the female began maneuvering about in a patch of hot sunshine. Just before the birth of the little lizards, the female spread the hind legs and slightly raised the posterior portion of her body.

The young emerged snout foremost and venter up. They were enclosed in a thin membrane and for a period of from 60 to 90 seconds after birth, they remained motionless. Suddenly the little sack would seem to explode and the baby lizard would appear, roll over on its belly, and run a few inches. He would then rub himself and burrow in the hot dust until dry.

The young were born at intervals ranging from 15 to 90 seconds. After each young one arrived, the female moved forward two to four steps and waited for the next. They averaged 7/16 inches snout to vent. No egg tooth was apparent.

The little lizards were exceedingly active from the moment they emerged from the membranous covering. In less than 30 minutes after birth they would attack small ants and shake them violently before swallowing them.

All measurements were made with a transparent plastic rule. The lizards were held, belly up, in position beneath the rule and the readings made through the rule directly on the subject. We have found this to be an easy method of measuring most lizards.—**Jack Dammann, Phoenix, Ariz.**

★ ★ ★

AN UNUSUAL HABITAT FOR THE KEELED GREEN SNAKE.—There are several records of the keeled green snake, **Opheodrys aestivus** (Linne), inhabiting the grassy margins of ponds and streams, but there are no cases mentioned of its being found beyond the banks or shore-line. While hunting for water snakes by canoe on Lake Drummond in the Dismal Swamp, Virginia, on June 25, 1949, with John T. Wood and Harold J. Walters, an adult specimen of **Opheodrys aestivus** was found basking on the side of a cypress stump, which rose about eighteen inches above the water about 125 feet from shore. The stump was only one of many trees, logs, and stumps scattered about in the water near the shore. The snake remained motionless until we closely approached the stump, when it glided toward the top where it was captured. The snake could have reached the stump by swimming or floating there on some object. No effort was made to see if the snake would take to the water. Another specimen, a gravid female, was found on a piling about three feet from the bank in the Dismal Swamp Canal. However, this specimen could have reached its basking place by means of an overhead branch. These instances show that this snake does inhabit the edges of streams and ponds at least in the hot summer months, and possibly may even take to the water.—**Wm. E. Duellman, 436 Greenmount Blvd., Dayton 9, Ohio.**

★ ★ ★

CLEMMYS MARMORATA FROM TILLAMOOK COUNTY, OREGON.—During the fall of 1948, a live specimen of the Pacific pond turtle, **Clemmys marmorata**, was sent in to the museum by Mr. Alex Walker of Blaine, Tillamook County, Oregon. He stated that the turtle was collected on the road near Blaine on August 1, 1948. The specimen is apparently a female, and has carapace and plastron lengths of 177 mm and 167 mm respectively. The turtle has been preserved (OSCMNH No. 552).

That this is not an isolated record is borne out by Mr. Walker's statement that turtles can be seen regularly in pools and backwaters of the Tillamook River, which flows northward into Tillamook Bay from headwaters about ten miles northwest of Blaine. The identification of all of these sight records is questionable, since Mr. Walker and other observers contend that the western painted turtle (**Chrysemys bellii bellii**) also occurs in that area. Mr. Walker has in his personal collection a painted turtle collected one-fourth mile west of Blaine on July 15, 1924.

Blaine is located about 25 miles north and 30 miles west of Salem, Oregon, and is in the coastal drainage system rather than the Willamette Valley. This record indicates a distribution to the northwestward well beyond the limit defined by Evenden (Herpetologica 4:201-204), and refocuses on the possibility that **Clemmys marmorata** may occur to the Columbia River (in coastal areas), and quite possibly beyond.—**Robert M. Storm, Natural History Museum, Oregon State College, Corvallis, Oregon.**

The Identity of Tropidonotus Baronis Mulleri Troschel*

By Hobart M. Smith

The correct disposition of the name **Tropidonotus Baronis Mulleri** Troschel 1865 (in Muller, Reisen Ver. Staat., Can., Mex., vol. 3, pt. 3, pp. 610-611) has never been agreed upon. Smith (Zoologica, vol. 27, 1942, p. 97) regards the name as not binomial (as required for a **species** name, as this is not a subspecies) and therefore not available. He states, however, that the name apparently is based upon individuals referable to **Thamnophis melanogaster canescens** of the same paper (**op. cit.**, pp. 117-120). A more recent account (Smith, Nixon and Smith, in press) perpetuates the same view of the status of Troschel's name.

In both of the recent papers cited, the name **Baronis Mulleri** is regarded as never having been made available; an emendation by Boulenger (Cat Snakes Brit. Mus., vol. 1, 1893, p. 226), citing in the synonymy of **Tropidonotus melanogaster** (Peters) (Monatsb. Berl. Akad. Wiss., 1864, pp. 389-390) the name **Tropidonotus baronis-mulleri** (Troschel), is regarded as making the latter name available with Boulenger as the author. The name thereupon, by citation, automatically becomes a junior synonym of **Thamnophis m. melanogaster** (Peters).

My colleagues have contested the finality of both these two views upon (1) the availability of T. Baronis Mulleri of Troschel, and (2) the origination of **T. baronis-mulleri** with Boulenger. Inasmuch as the contrary views would necessitate resurrection of Troschel's name, I have made an effort to locate Troschel's types. Dr. Robert Mertens, to whom the inquiry was directed, replies that upon investigation the types are revealed as having been destroyed in the bombing of the Zoological Institute of the University of Bonn. Inasmuch as they are no longer extant, a neotype may be designated to replace the original types.

Accordingly I hereby designate E. H. Taylor No. 5063 as neotype of **Tropidonotus Baronis Mulleri** (Troschel). This specimen is from Lake Xochimilco, Distrito Federal, Mexico, and is a typical adult female **Thamnophis m. melanogaster**, of which Troschel's name, if regarded as available, becomes incontrovertibly a junior synonym. The neotype has 19-19-17 scale rows, 145 ventrals, 57 caudals, 8-8 supralabials, 10-10 infralabials, 2-2 preoculars, and 2-2 postoculars.

In spite of the tentative allocation of Troschel's name with **canescens** by Smith in 1942 (**loc. cit.**) and by Smith, Nixon and Smith, the fact remains that the only reason for that disposition is the description by Troschel of "a black median longitudinal band" on the belly. Although this does better fit **canescens** than **melanogaster**, the description is applicable to the latter especially if no mental comparison is made with a more extreme form as **canescens**. The band is simply much broader in one than in the other, yet the description could be applied to either. Furthermore, the combination of ventral and caudal counts (150 and 54 respectively) given for **Baronis Mulleri** is found duplicated only in female **m. melanogaster** (145 to 153 ventrals in 9, 51 to 61 caudals in 7). Male **m. melanogaster** have more caudals (59 to 68 in 5), and ventrals (152 to 158 in 5). In **canescens** the ventrals are too few in females (137 to 147 in 44) and the caudals too numerous in males (59 to 73 in 33).

Another important point to consider is the probable origin of the specimen. While the exact derivation of the types is unknown, unquestionably the environs of Mexico City were visited, and that the types may have been secured there is apparent.

Accordingly, the designation of a neotype, for **Tropidonotus Baronis Mulleri**, that happens to be typical of an earlier-named race seems entirely justified not only in the interest of stability but also by all the meager data supplied for the type.

—**University of Illinois, Urbana, Ill.**

*Contribution from the University of Illinois Museum of Natural History and Department of Zoology.

OVERSEAS SUBSCRIPTIONS

European Publications are accepted in trade for subscription to HERPETOLOGICA in cases where dollar exchange is impractical. Any such publications will be offered to our Members and friends at list price to reimburse the H. L.

STATUS OF THE GENERIC NAME **LIOHETERODON** APPLIED TO MADAGASCAN SERPENTS.—In 1893, Boulenger (**Cat. Snakes Brit. Mus.**, 1:268) segregated as a distinct genus the Madagascan snakes previously referred to the American genus **Heterodon.** For the two Madagascan species he used the generic name **Lioheterodon.** which he cites as having been proposed by Duméril and Bibron in 1844 (error for 1854) in the **Atlas of the Erpétologie Générale.**

Upon looking over Duméril and Bibron's work, it becomes evident that the name **Lioheterodon,** which he cites as having been proposed by Duméril and Bibron places, to wit: (1) vol. 7, part 1, p. 776, in reference to the atlas; (2) vol. 7, part 1, p. 777, in the discussion; (3) vol. 7 part 2, p. 1533 in the index; (4) atlas, p. 15, in explanation of the plate; and (5) pl. 60, in the legend. All of these references are of the year 1854. In every one of these places except the last, the name is shown plainly to be a synonymous manuscript name not accepted by the authors; this, however, has no effect on the availability of the name under the International Rules. What does affect the availability of the name under the Rules is the fact that, in every one of the five places the name appears, it is used solely as a French vernacular name, with the French accent marks in place. This type of usage is common in Duméril and Bibron (and many other French works), as can plainly be seen by their usage of other names in the same way, and by their great care not to use the French form and accents whenever they are using or quoting a scientific name formally, even one that they do not accept. One need only look at the explanations of the plates and the plates themselves to see that every species name listed there is in the vernacular, even though in some instances the vernacular and the formal scientific name may be spelled the same. Since names printed only as vernacular names are not acceptable under the Rules, the only possible conclusion is that Duméril and Bibron formally proposed no such name and that Boulenger alone is responsible for the generic name he used. It must be cited as **Lioheterodon** Boulenger, 1893, and since I find no type designation, I designate **Heterodon madagascariensis** Duméril, Bibron and Duméril as the genotype. **Lioheterodon** Boulenger, 1893, is subsequent to and a synonym of **Anomalodon** Jan., 1863, whose monotype is the same as the above-designated type of **Lioheterodon.** However, **Anomalodon** of Jan is preoccupied by **Anomalodon** S. Bowdich (1825; in: T. E. Bowdich, **Excursion Madeira and Gambia,** p. 237), a fish. Therefore, **Lioheterodon** Boulenger, 1893, will stand as the generic name of the Madagascan snakes. — **George S. Myers, Stanford University, Calif.**

★ ★ ★

SALE OF BABY REPTILES

Mr. Frederick R. Chaffee, Curator of Herpetology, Worcester County Herpetological Society, Worcester, Mass., has written a petition asking support of a bill forbidding the sale of baby alligators and turtles. He states that many of these pets do not receive proper care and perish as a result. The Editor would like to hear from our Members as to whether they believe that the interest aroused in Natural History outweights the damage done.

★ ★ ★

A SEPERATE HERPETOLICIAL SECTION OF "BIOLOGICAL ABSTRACTS"?

Dr. John E. Flynn, Editor-in-Chief of Biological Abstracts, in kind response to our inquiry, stated that it may be possible to publish a separate section on Herpetology provided 400 subscribers are assured. The next issue of HERPETOLOGICA will state the approximate cost of this section.

AN INDICATION OF SLEEP IN SNAKES.—Investigating my cages by flashlight one night, a peculiar condition of the eyes of a pilot black snake, **Elaphe obsoleta obsoleta** (Say), was noted. The pupil of the left eye was directed forward and downward to a position of eight o'clock, and the pupil of the right eye was directed upward to a position of 12 o'clock. Both pupils were greatly contracted and appeared to be tangent to the ocular scales. Either the light shining in its eyes or a vibration transmitted through the cage disturbed the snake, for the eyes assumed their normal position, the pupils were observed to dilate slightly, and the snake moved its head as if to withdraw from the beam of light. Subsequent, purposeful investigation disclosed a similar condition of the eyes of other species of **Elaphe** and in two species of **Lampropeltis.**

The pupils of the eyes of different snakes, and of the same snake on consecutive investigations, may not assume the positions noted above. However, the pupils are always contracted when a snake is apparently sleeping. The most commonly assumed positions of the pupils are: one pupil directed forward and upward, the other directed forward and downward; one pupil directed forward and/or upward or downward, the other pupil centered in the eye orbit.

If, during the observation, the snake is not disturbed, a gradual change in the intensity of the light (a two-cell flashlight is used) shining in the eye will not result in either a contraction or dilation of the pupil. However, by flickering the light in the eye or by striking the cage, the eyes assume normal alignment, the pupils dilate (if only minutely), and the snake may move slightly.

This phenomenon is most frequently observed at night. If the cage is approached cautiously, the "sleeping" condition may be noticed during the day. That this phenomenon occurs in **Elaphe obsoleta obsoleta** (Say), **Elaphe obsoleta confinis** (Baird & Girard), **Elaphe quadrivittata quadrivittata** (Holbrook), **Elaphe loqissima** (Laurenti), **Lampropeltis getulus niger** (Yarrow), and **Lampropeltis calligaster** (Harlan) is demonstrated by the captive specimens of these species which I have. I presume that it also occurs in other species, but attempts to observe it in other species have been unsuccessful.—**Richard M. Johnson, 213 W. Lincoln Ave., Delaware, Ohio.**

Mr. Johnson submitted this observation on May 14, 1949, but unfortunately it was not published in part 4, July 1, 1949. The suggestion made to Dr. Munro, and mentioned by him in his article pp. 106-108, part 5, was from observations made by me many years ago. The position of the eye in sleep was unknown to me and was observed by Mr. Johnson and Dr. Munro independently. Mr. Johnson was entitled to priority of publication.—Fd.

★ ★ ★

CAESAREAN BIRTH OF A BROOD OF **NATRIX SIPEDON SIPEDON**.—A gravid three-foot **Natrix** had been subject for about a month to a disease which caused sudden spasmodic contractions. The nearly dead specimen was decapitated on the ninth of October, 1948. An incision was immediately made near the vent and pressure exerted near the middle of the body and slowly worked backward until twenty young snakes in their transparent membranes were extruded. Four were dead. Each was still attached to a small yolk. Within five minutes sixteen freed themselves from the membranes and a few freed themselves from their yolks. Within half an hour, all but three had freed themselves from their yolks. Two of these died and the third detached itself in two hours. These three were not as completely formed as the others and had difficulty in freeing themselves from the yolk. They had a tendency to curl their tails.

On an average, the brood measured 165 mm in length and 3.5 mm in diameter at the thickest part. The pattern averaged 48 bands along the full length of the body, instead of breaking into blotches posteriorly as is usual. These bands were approximately 1 to 2 mm wide dorsally and narrower at the sides, separated by spaces of .5 to .8 mm. There were two, and in some cases four, elongate blotches on each side of the dorsal portions of the head and neck. The ground color was light gray, and the bands black.

Some of these snakes shed their skins a few minutes after birth, others a few hours later, while others shed a few days later. All had difficulty shedding until put into a tank of warm water containing jagged rocks, when they shed easily.

On the tenth of October one poorly formed specimen died, leaving thirteen. The snakes had shown no interest in food until October thirteenth, when most were feeding on tiny scraps of fish and appeared to be very healthy.—**Raymond Batson, 3070 Colorado Blvd., Denver, Colorado.**

SNAKES EATEN BY THE TARANTULA, **EURYPELMA CALIFORNICA**.—On August 10, 1949, five Blue Racers, **Coluber constrictor flaviventris** (Say), hatched and were placed in a small terrarium with a large Tarantula, **Eurypelma californica** (Ausserer), and several scorpions, **Centruroides vittatus.** On August 15 a Blue Racer was found dead with a badly mutilated neck. At this time, the scorpions were blamed because of their method of feeding. It was later necessary to remove the scorpions to another terrarium, leaving only the Tarantula, the Blue Racers, and insects for their food. On August 22, a newly hatched Hog-nosed snake, **Heterodon p. platyrhinos** (Latreille), was placed in the terrarium. On September 9, the second Blue Racer was found dead, exhibiting the same mutilation as the first. Some three days later, September 12, the Hog-nosed was found in the same condition, and on September 17, another Blue Racer was found dead.

In all instances, the neck and the region surrounding the vent had been badly mutilated, and seemed to be dessicated. The culprit was now known to be the Tarantula, and the chewed appearance was a result of multiple punctures of the spider's fangs, and the sucking feeding habit was the cause of the apparent dessication.

The fact that the snakes and spider were in unnatural surroundings probably resulted in this peculiar feeding habit of the Tarantula. According to Dr. Bearg of Arkansas, (J. New York Ent. Soc. Vol. XLVI, pp. 38-40, Mar. 1938), "Their cruising range is probably not more than a few inches." Baerg states further, "The large species, **Dugesiella crinita**, occurring in northern Mexico . . . is a rather general feeder, accepting . . . small snakes." There are, however, no similar records for **Eurypelma californica.—Virgil Owens, University of Missouri, Columbia, Missouri.**

★ ★ ★

NOTES ON THE EGGS OF **HELODERMA HORRIDUM**.—There is apparently no published information on the life history of the Mexican beaded lizard, **Heloderma horridum** (Wiegmann). A female measuring 685.8 mm in total length was received from a dealer on October 14, 1948. The only locality data was "Mexico." The lizard was placed in a glass cage with approximately one inch of sand covering the floor. Beginning on the following January 31 and ending February 20, a total of fifteen eggs were deposited at irregular intervals. Previous to discovery, three of the eggs were destroyed, probably due to trampling. Length and width measurements of the remaining twelve are as follows (in millimeters): 55x27, 56x25, 57x26, 58x25, 58x27, 60x25, 60x25, 60x25, 60x26, 62x23, 63x25, 66x26. Average size, 59.6x25. All were non-adhesive, smooth, and closely resembled Ditmars' illustration of an egg of **H. suspectum** (Ditmars, R. L., 1945, The Reptiles of North America, pl. 9). On the two occasions extrusion was observed the lizard employed her hind legs in an attempt to cover the eggs with sand. The length of time to complete laying, twenty-one days, is thought to be possible evidence of a slight retention of the eggs until a more suitable depositional area could be located, i. e., a place in which to dig a burrow as is the habit of **H. suspectum** (Ditmars, **ibid.**, p. 91). Following Perkins' method of incubating reptile eggs, (Perkins, C. B., **Herpetologica**, vol. 4, part 5, p. 184), these were placed in a number of separate glass dishes at a temperature between 80° and 85° F. In a short time, however, the entire clutch became foul and upon examination revealed a pasty material inside with no embryos present, a condition which would indicate infertility.—**Lawrence Curtis, 4145 Normandy Ave., Dallas 5, Texas.**

★ ★ ★

RANGE EXTENSION OF **XANTUSIA VIGILIS**.—The Desert Night Lizard, **Xantusia vigilis**, has usually been associated with the Joshua tree areas of our California deserts. In the early part of June, 1949, while collecting in Sonora, Mexico, with the late Mr. Wallace Wood, one of these lizards was taken in a typical creosote bush area twenty-five miles south of San Luis, Sonora, Mexico. It was captured while hunting at night with a gasoline lantern and was found running along the tire tracks made by fish trucks traveling between San Luis and El Gulfo. As far as known this is the first record from the Mexican mainland.—**Joseph R. Slevin, Cal. Acad. Sci., San Francisco, Cal.**

A Geographic Variation Gradient in *Cnemidophorus*

By Richard L. Hoffman

Some of the aspects of geographic variation in frogs were discussed by K. P. Schmidt, Zool. Ser. F. M. N. H., **20**:377, 1938. A similar latitudinal variation trend in the eastern race-runner, **Cnemidophorus sexlineatus** (Linnaeus) is worthy of note.

As long ago as 1944, I observed that race-runners from western Virginia differed in certain respects from more southern individuals, particularly as regards head scales. In following this further, I noticed that in specimens from Maryland and Virginia the parietals tended to become divided, from the modal number of three, into as many as ten small scales.

Special attention was paid to the population along the Atlantic Coast, and virtually all of the extant material from at least Maryland and Virginia was examined. Only a few specimens from the Midwest were studied, but it does not seem that the south-north variation in parietals is especially developed in that region. East of the Appalachians, as the data will show, there is a striking tendency towards fission of the parietals, increasing from south to north. Some workers might even feel justified in proposing a name for the Maryland population, but I regard it with hesitancy, at least until more exhaustive surveys have been made. The following tabular representation of the regional variation in parietal number will illustrate the nature of the cline.

State	3	4	5	6	7	8	9	10	11	No.	Aver.
Md.	0	3	7	4	2	1	0	1		18	5.72
Va.	4	5	11	5	1	0	0	0	1	27	5.24
N. C.	10	5	6	4						25	4.16
Fla.	13	1	3							17	3.41

From the above figures, one might suspect that the Maryland population is subspecifically distinct on the basis of having more than three parietals (i. e., the normal plates once or more divided). Using the division point, however, which would be most useful in this connection — between 3 and 4 — and figuring the numerical percentages of the occurrences of both subsequent groups, the following disposition is noted:

State	3 parietals	4 or more
Maryland	0.0%	100%
Virginia	15.4	84.6
North Carolina	40.0	60.0
Florida	76.4	23.6

It is plain that the two extremes involved are distinctive enough, but the problem of where to divide subspecies and intergrades is difficult. One solution lies in a duplication of the condition found in the green tree frogs, **Hyla cinerea**, in which the northern subspecies is recognizable only in Maryland and "intergrades" occur south as far as Florida. The parallelism occurring in geographic variation in the frog and lizard is of interest in itself, and poses the question whether or not one is justified in continuing to recognize as a subspecies **Hyla cinerea evittata** Miller. Without establishment of an arbitrary point of separation (such as the usually accepted "75% rule") I think it is impossible to say where the Maryland population (or subspecies) stops and intergrades commence. It seems that in both cases the phenomena which some might call terminal raciation are little more than the culmination of an even geographic progression of a tendency (towards loss of a stripe or breaking up of a scale). Such instances are clearly different from that well illustrated by the Silvery Footless Lizards in California, **Anniella p. pulchra** and the suddenly different terminal race **A. p. nigra.**

—Clifton Forge, Virginia.

★ ★ ★

A LARGE MICRURUS.—An unusually large specimen of **Micrurus f. fulvius** was captured and killed by Arthur Connelly, of 3407 Wisconsin Ave., Tampa, Fla., on Bay St. and Interbay Blvd., suburban Tampa, on September 29 about 10 P. M. The reptile was examined by John F. Seaton and found to be a female, 1117.6 mm in length before preservation. Scale rows 15-15-15. Ventrals 238. Caudals 32. Supralabials 7. Infralabials 7. Oculars 1-2. Black rings 16-4. Total length after preservation 1092.2 mm. Tail length 90 mm. The specimen is now in the collection of the Hillsborough County Herpetological Society, Tampa, Florida.— **Frank H. Seaton.**

POISONING OF SNAKES BY THE "RED WORM".—On August 29, 1948, an adult female Plains Garter Snake **Thamnophis radix** (Baird and Girard) gave birth to 18 young, 7 of which were stillborn, though normal in appearance. The living young were placed in a vivarium with an adult **Storeria occipitomaculata** (Storer).

I was very pressed for time during the succeeding two weeks and had no opportunity to obtain food for the snakes in this vivarium so in lieu of other readily obtainable food and having no notion of the habit of live bait dealers in Chicago selling the little Red or Manure Worm instead of the Earthworm commonly seen, I went to a live bait store and procured a carton of "fishing worms," a number of which I placed in the vivarium. They were immediately set upon by several of the young **Thamnophids** and the **Storeria**, deglutition occurring without incident on the part of all snakes which attempted to feed with the exception of two of the young. These grasped the worm and almost immediately released their hold. After completion of deglutition three or four of the young were seen to hold their mouths open and to writhe as though attempting to produce emesis. Several hours later vomiting was completed by one of the young, the others having been unsuccessful. Gentle digital pressure along the belly proved of no value in inducing emesis in these. Two of the young and the **Storeria** made no attempt to vomit, the latter seeming to be completely undisturbed as evidenced by the fact that he ate another worm.

On the following day all the young which had eaten a worm were dead with the exception of the one that had vomited, who was unaffected. All of the dead young were perfectly relaxed. The **Storeria** was acutely ill, appearing to be in a state of flaccid paralysis. It was capable of moving its head slightly and upon violent stimulation, such as pinching, could twitch its tail. Tongue movement was infrequent and slow, breathing was very slow and dyspneic. This condition continued until death supervened, capability of movement decreasing markedly terminally, however. There were no contractions either clonic or tetanic prior to death.

On necropsy partially digested remnants of the worms were found throughout the intestinal tract from pharynx to the lower intestine, possibly indicating hypermotility of the digestive apparatus. The lower gut was mildly hyperemic but no evidences of hemorrhage were grossly obvious. Cloacal uric acid was green in color as though stained by biliverdin. The postcava through the liver was engorged and the liver was engorged and hyperemic with rather marked nutmeg mottling.

These findings suggest a toxin so that the feeding of Red Worms to captive reptiles seems to be strongly contraindicated. These terrestrial Annelids may be distinguished from their more nutritious relatives by their small size, about 100 mm in length on the average, and their dark red color. Their preferential habitat seems to be manure heaps.—**Warren P. Sights, Chicago, Ill.**

★ ★ ★

COPULATION OF **CLEMMYS GUTTATA** AND **PSEUDEMYS TROOSTII ELEGANS**.—On May 17, 1949, I noticed what appeared to be a fight between a male **Clemmys guttata** (4⅜ inch carapace) and a small female **Pseudemys troostii elegans** (4 inch carapace) in one of my aquariums. Upon closer observation, the two specimens were found to be copulating. The male was on top of the female and gripped the edges of her carapace with fully extended forelegs and his rear legs gripped the female's carapace, but were retracted as much as possible. The male clung to the female in a position which brought the anal regions of both animals in close conjunction. The head and neck of the male were fully extended and any attempt by the female to move or reach the surface of the water was met with vigorous biting by the male. Twenty minutes after being first noticed, the male released the female and swam slowly away. The copulatory organ of the male was about ⅝ inch long, shaped somewhat like a thick almond, and light brownish black in color. The organ was withdrawn from the female and fully retracted in about a minute and a half.—**John Mehrtens, 74 Elder St., Brooklyn, New York.**

Gila Monster in California ?

By Weldon D. Woodson

According to a newspaper account, in 1948 two men were tearing down some buildings at an airport near Blythe, a few miles west of the Colorado River on the California side. They raised a board and reportedly found a five-inch Gila monster (**Heloderma suspectum**). Since adults of this species average from 12 to 18 inches in length, this obviously — if it were a Gila monster — was in the young stage.

The alleged find arouses speculation as to whether this lizard exists in the native state in California. Therefore, we shall briefly review the literature on the subject. In 1869, Dr. J. G. Cooper lists **H. horridum** as found in California. That was the year that Cope published his conclusion that the genus **Heloderma** is divided into two species. Dr. Cooper undoubtedly had in mind **H. suspectum.**

Vick (1902), Willey (1906, and Douglas (1910) each reported that the Gila monster had been seen. None, however, related a specific instance in which it had been observed. Of further significance is that none of these were professional scientists, and that their writings were of a popular nature. Davison, author of a zoology textbook, in 1906 also mentioned California as host to this lizard.

A well known popular writer, George Wharton James, stated in 1906: "The Gila monster, **Heloderma suspectum** (Cope), is seldom seen in the Colorado Desert, though in twenty years I have seen three or four."

Van Denburgh in 1897 commented: "It may be that it occurs on portions of the deserts of southeastern California, but as yet no specimens from this area have found their way into museums."

In 1914, Frank Stephens recorded his belief that prospectors and cattlemen who have reported seeing the Gila monster in the southeastern part of California have really seen the chuckwalla.

Ogston, Chief Ranger, Death Valley, writes me: "Superintendent Goodwin has lived in this desert area for many years and informs me he has never heard of or contacted a Gila monster in this section of California. Other persons I have talked to had the same story to tell."

As far as is known, the Gila monster is not indigenous to California. Those few specimens that have been taken could be escaped pets. Furthermore, there is always the possibility that the individual reported as a Gila monster was another lizard. Laymen have mistakenly designated the chuckwalla and others as the Gila monster.

Literature Cited

Cooper, J. G. (M. D.). The fauna of California and its geographical distribution. Proc. Cal. Acad. Nat. Sci., IV (1869), 67.

Cope, Edward D. On **Heloderma suspectum.** Proc. Acad. Nat. Sci. Phil., XXI (1869), 5.

Davison, Alvin. Practical zoology. New York, 1906. p. 213.

Douglas, Ernest. The Gila monster. A convicted suspect. Arizona Mag., I (Dec. 1910), 9-10.

James, George W. The wonders of the Colorado desert. Boston, 1906. Vol. I.

Ogston, E. E. Personal communication, April 24, 1945.

Stephens, Frank. Arid California and its animal life. 23rd Annual Report of the California Fish and Game Commission. 1914. p. 134.

Van Denburgh, John. The reptiles of the Pacific coast and great basin, an account of the species known to inhabit California, Oregon, Washington, Idaho and Nevada. Occas. Papers Cal. Acad. Sci., V (1897), 120-122.

Vick, E. C. The Gila monster. Country Life in America, I (1902), 102.

Willey, D. A. Gila monsters. Scientific American, XCV (1906), 192.

—Los Angeles. California.

★ ★ ★

FOR THE SUB-DEB HERPETOLOGIST

SNAKES, by Herbert S. Zim., Wm. Morrow & Co., 425 Fourth Ave., N. Y. $2.00. This book, charmingly illustrated by James Gordon Irving, contains all the basic facts on snakes without a misstatement, written so that children and even adults will profit. An ideal Xmas gift for a youngster with a flair for Natural History.

AGRICULTURE LIBRARY MAY 6 1950 MANHATTAN KANSAS

LIBRARY MAY 6 1954 MANHATTAN

MAMMAL DIET OF **HELODERMA**.—Due to the lack of evidence concerning the natural diet of **Heloderma suspectum** it was deemed expedient to record this positive instance of small mammals being taken in the wild. So far as is known by the writer, this is one of the few cases, if not the first, where mammals were positively known to have been consumed by Gila Monsters in their native habitat.

This specimen (Cornell University Museum No. 4499) was taken alive April 7, 1949, on the Mexican border, 10 miles west of the Sonoyta port of entry, Pima county, Arizona.

The reptile was placed in a tight screen-wire cage overnight. On the following morning regurgitation was removed from the cage and upon examination proved to be nestling Arizona cottontails, **Sylvilagus audubonii arizonae.** Age of the rabbits was estimated to be 10-14 days. One specimen was in particularly good condition with only the eyes being removed by the digestive processes. The skin was intact, except for one puncture above the left hind leg. Hair, claws, teeth, and coloration were unchanged. The second was less complete with the viscera absent, skull bones softened considerably, and in a generally mangled condition. Skin and hair were present on the head, legs, and left side. The remaining individual was almost completely digested with only three legs, parts of the vertebral column and strips of skin distinguishable. All three specimens are in the collection of the writer.

Earlier in the week a border patrol rider gave the author an eye-witness account of a **Heloderma** regurgitating a young nestling cottontail while being attacked by a dog. The rabbit, apparently, had been swallowed only a short time before. This incident, reputedly, had taken place in the same general locality and only a few days prior to the date of the record mentioned above.

In addition to the above instances, a live specimen now in the University of Illinois Museum of Natural History was recorded by Dr. Hobart M. Smith (letter) to have consumed a house mouse, **Mus musculus** that was offered it. This specimen, collected by the writer during May, 1949, was taken about 10 miles south of the locality for the **Heloderma** discussed herein. — **M. Max Hensley, Laboratory of Ornithology, Cornell University, Ithaca, New York.**

★ ★ ★

FORCE-FEEDING OF REPTILES.—Occasionally reptiles, especially snakes, refuse to take food. Various methods have been tried to force-feed these animals, but always with doubtful success. One of the main difficulties in the process is the prevention of injury to the mouth tissues.

We have successfully force-fed snakes now for over twelve months. A liquid diet, generally whipped eggs, is used. In order to get this into the animal we conceived the idea of using a male catheter tube and a syringe. Since these tubes can be obtained in rather small diameters, we have been able to force-feed very small snakes. If the tube is lightly lubricated, it can be inserted down the esophagus with very little difficulty, and then by means of an ordinary syringe the liquid can be gently poured into the digestive tract. Very little discomfort is indicated by the animal.—**Herbert L. Stahnke, Dir., Poisonous Animals Research Laboratory, Arizona State College, Tempe, Ariz.**

★ ★ ★

OVOVIVIPARITY OF **SCELOPORUS JARROVII JARROVII**.—Hobart Smith (Handbook of Lizards) has mentioned that while **Sceloporus jarrovii** is almost certainly ovoviviparous, the fact has not been definitely established. A gravid female **S. jarrovii** was collected in Carr Canyon, Huachuca Mountains, Cochise County, Arizona, at an elevation of 7000 feet on May 28, 1949. The lizard was returned alive to the laboratory and maintained on a diet of mealworms until the young were born on the 27th of June. When the young lizards were first observed on the evening of the 27th, all ten had been born. There were no remains of embryonic membranes in the container. The young lizards averaged 24 mm S-V length; the mother measured 80 mm S-V length. In pattern the young closely resemble the adult female.—**Richard G. Zweifel, Zoology Dept., University of California, Los Angeles.**

★ ★ ★

Volume V of HERPETOLOGICA consisted of:

Part 1, Feb. 1; Part 2, Feb. 23; Part 3, May 31; First Supplement, May 31; Second Supplement, June 30; Part 4, July 1; Part 5, Sept. 10; Part 6, Dec. 15, 1949.

END VOL. V.

HERPETOLOGICA

Volume V

1949

abacura, Farancia, 6
Acanthodactylus cantoris cantoris, 121
Acrantophis madagascariensis, 5
Acris crepitans, 75
  gryllus, 120
  gryllus crepitans, 84
    dorsalis, 78
acutus, Crocodylus, 3
aestivus, Opheodrys, 50, 89, 144
Agama agilis, 121
  melanura, 121
  torquata, 16, 18
agilis, Agama, 121
agilis, Mabouya, 128
Agkistrodon contortrix contortrix, 89
  mokeson austrinus, 93
    cupreus, 107
    laticinctus, 5
    mokeson, 5, 50
  piscivorus leucostoma, 71, 89
    piscivorus, 115, 116, 117
Ahaetulla tristis, 82
Alsophis ater, 128
  portoricensis, 5
Alsophylax tuberculatus, 121
alterna, Lampropeltis, 140
alvarius, Bufo, 3
amaura, Lampropeltis doliata, 90
Amblystoma jeffersonianum, 34
  macrodactylum, 34
  maculatum, 33, 34, 37, 39
  Opacum, 34, 39
  texanum, 34, 39
  tigrinum, 34, 39
Amblystomidae, 33, 34, 35, 37, 38, 41
amboinensis, Cyclemys, 3
Ambystoma gracile decorticatum, 139
  jeffersonianum, 137
  maculatum, 76
  tigrinum, 85
  tigrinum tigrinum, 2
Ameiva, 128
Ameiva dorsalis, 128
americanus, Bufo, 49
americanus, Bufo terrestris, 30, 31, 32
americanus, Scincus, 15, 18
Amphibolurus barbatus, 4
Amphiuma, 38, 39, 42
Amphiuma means, 2
Amphiumidae, 35, 38, 41
Amyda ferox, 118, 119
Anamalodon, 146
Aneides, 40
Aneides ferreus, 139
Anguis fragilis, 4
augulifer, Epicrates, 6
Anniella geronimensis, 27, 28
  pulchra nigra, 149
    pulchra, 27, 28, 149
annulata, Boa, 5
annulata, Lampropeltis doliata, 59
annulata, Leptoderia, 6
Anolis carolinensis, 88, 118
  equestris, 4
  grahami iodurus, 128
  lineatopus, 128
  luteogularis, 4
  opalinus, 128
anthicus, Coluber constrictor, 88
apodus, Ophisaurus, 5
areolata, Microhyla, 78
argus, Morelia, 6
arietans, Bitis, 5
Aristelliger praesignis, 128
Arizona elegans, 18
arizonae, Coluber, 15, 18
arizonae, Xantusia, 23
arnensis, Oligodon, 82
arnyi, Diadophis punctatus, 49
Ascaphus truei, 139
ater, Alsophis, 128
Atretium schistosum, 83
atricaudatus, Crotalus horridus, 89
atrox, Crotalus, 5
austrinus, Agkistrodon mokeson, 93
avivoca, Hyla, 78

baileyi, Crotaphytus collaris, 127
bairdandgirardi, Sceloporus, 15, 18
barbatus, Amphibolurus, 4
barbouri, Eunectes, 6
barbouri, Graptemys, 10, 106
Baronis Mulleri, Tropidonotus, 145
baronis-mulleri, Tropodinotus, 145
Bascanion semilineatum, 15, 18
Basiliscus vittatus, 4
Batrachoseps, 36, 40
Batrachuperus, 33, 35
Batrachuperus pinchonii, 35, 40
baurii, Kinosternon baurii, 119
becki, Sceloporus occidentalis, 47
bealei, Clemmys, 3
belliana, Kinixys, 4
bellii, Chrysemys bellii, 144
bellii, Chrysemys picta, 3
bengalensis, Varanus, 5
berlandieri, Rana pipiens, 84
bicolor, Loxocemus, 6
bilineatus, Masticophis, 18
Bitis arietans, 5
bivittatus, Python molurus, 6
blandingii, Boiga, 5
blandingii, Emys, 3

blanfordi, Ophiomorus, 122
Boa annulata, 5
  canina, 5
  enydris enydris, 5
Boiga blandingii, 5
  dendrophila, 5
Bolitoglossus, 36, 40
boreas, Bufo, 3, 85, 139
braminus, Typhlops, 82
brunnea, Hyla septentrionalis, 128
butleri, Thamnophis, 7
Bufo alvarius, 3
  americanus, 49
  boreas, 3, 85, 139
  compactilis, 3, 78
  marinus, 3
  peltacephalus, 3
  quercicus, 30
  terrestris, 78, 118, 120
  terrestris americanus, 30, 31, 32
  terrestris, 30, 31, 32
  woodhousii, 85
  woodhousii fowleri, 30, 31, 32, 76
Bungarus caeruleus, 122
  caeruleus caeruleus, 83
  caeruleus, Bungarus, 122
  caeruleus, Bungarus caeruleus, 83
Caiman latirostris, 3
  sclerops, 3
calligaster, Lampropeltis, 21, 147
calligaster, Lampropeltis calligaster, 89
callilaemus, Dromicus, 128
canescens, Thamnophis melanogaster, 145
canina, Boa, 5
cantoris, Acanthodactylus cantoris, 121
carinata, Mabuya, 82
carinatus, Echis, 83, 123
carinatus, Leiocephalus, 5
carinatus, Sternotherus, 4
carolina, Terrapene carolina, 75
carolinensis, Anolis, 89, 118
carolinensis, Desmognathus ochrorphaeus, 62
carolinensis, Microhyla, 3, 78
Carphophis amoena vermis, 89
casuarinae, Lygosoma, 5
catenatus, Sistrurus, 7
catesbeiana, Rana, 49, 75, 84, 115
Celestus crusculus molesworthi, 128
Cemophora coccinea, 90
cenchria, Epicrates, 6
cerastes, Crotalus, 57
Chalcides ocellatus, 4
Chamaeleon zeylonicus, 82
Chelodina longicollis, 3
Chelonia mydas, 123
Chelydra serpentina serpentina, 50, 75
Chelys fimbriata, 3
Chrysemys bellii bellii, 144
  picta bellii, 3
    marginata, 21
    picta, 75
Chrysopelea ornata, 82
cinerea, Hyla, 3
cinerea, Hyla cinerea, 120
cinereus, Plethodon cinereus, 76
clamitans, Rana, 75, 140
clarkii, Pseudacris, 78
Clelia clelia, 5
clelia, Clelia, 5
Clemmys bealei, 3
  guttata, 75, 150
  insculpta, 3, 75
  marmorata, 144
  muhlenbergii, 75
Cnemidophorus gularis gularis, 125
  sexlineatus, 88, 149
coccinea, Cemophora, 90
Coluber arizonae, 15, 18
Coluber constrictor anthicus, 88
  constrictor, 47, 76, 90, 96, 117
  flaviventris, 50, 53, 72, 74, 148
  stenjnegerianus, 53
  elegans, 15
  flagellum flagellum, 50
  guttatus sellatus, Sup. 2:10
  novae Hispaniae, 15, 18
  rhodorachis, 122
  subcarinata, 63, 64
compactilis, Bufo, 3, 78
compressus, Ophisaurus ventralis, 97
concinnus, Pseudemys floridana, 4
confinis, Elaphe obsoleta, 60 89, 147, Sup. 2: pp 1-12
confluens, Natrix sipedon, 89
Coniophanes imperialis imperialis, 60
conirostris, Zamensis, 53
Conolophus subcristatus, 4
consobrinus, Sceloporus undulatus, 140
constrictor, Coluber constrictor, 47, 76, 90, 96, 117
Constrictor constrictor constrictor, 5
constrictor, Constrictor constrictor, 5

Constrictor constrictor imperator, 5, 115, 141
contortrix, Agkistrodon contortrix, 89
corais, Drymarchon corais, 5
Cordylus giganteus, 4
couchii, Scaphipous, 3
couperi, Drymarchon corais, 90, 115
crepitans, Acris, 75
crepitans, Acris gryllus, 84
Crocodilus palustris, 121
Crocodylus acutus, 3
  moreletii, 3
  palustris, 3
  porosus, 3
Crotalus atrox, 5
  cerastes, 57
  horridus, 89
  horridus horridus, 50
  viridis viridis, 5
Crotaphytus collaris baileyi, 127
crucifer, Hyla crucifer, 75
Cryptobranchidae, 35, 38, 41
Cryptobranchus, 25, 37, 38, 39
cunninghami, Egernia, 4
cupreus, Agkistrodon mokeson, 107
curtus, Python, 6
Cyclemys amboinensis, 3
cyclopion, Natrix, 90
cyclopion, Natrix cyclopion, 117, 119
cyclura, Henicognathus annulata, 15, 18
Cyclura lophoma, 128
  macleayi, 4
Cynops, 36
Cynops pyrrhogaster, 40

decorticatum, Ambystoma gracile, 139
deckerti, Elaphe obsoleta, Sup. 2: pp 1-12
dekayi, Storeria, 50, 89
Dendroaspis viridis, 5
dendrophila, Boiga, 5
deschauenseei, Eunectes, 6
Desmognathus, 36
Desmognathus fuscus, 40, 42
  ochrophaeus carolinensis, 62
  quadramaculatus, 40
Diadophis punctatus arnyi, 49
  stictogenys, 90
Dicamptodon, 35, 40
doliata, Lampropeltis doliata, 8
dorsalis, Acris gryllus, 78
dorsalis, Ameiva, 128
dorsalis, Triturus viridescens, 94
Dracaena guianensis, 4
Dromicus callilaemus, 128
Drymarchon corais corais, 5
  couperi, 90, 115
  melanurus, 6
Drymobius margaritiferus margaritiferus, 59
Dryophis nasutus nasutus, 84
  pulverulentus, 83

Echis carinatus, 83, 123
Egernia cunninghami, 4
Elaphe guttata, 6, 21, 22, 90, 114, 115, 117
  guttata guttata, 118, Sup. 2: pp 1-12
  rosacea, Sup. 2: pp 1-12
  laeta, 6, 90
  logissima, 147
  longissima, 6
  obsoleta confinis, 6, 60, 89, 147, Sup. 2: pp 1-12
  deckerti, Sup. 2: pp 1-12
  lindheimeri, 6, Sup. 2: pp 1-12
  obsoleta, 6, 50, 75, 90, 114, 115, 147, Sup. 2: pp 1-12
  obsoleta quadrivittata, Sup. 2: pp 1-12
  rossalleni, Sup. 2: pp 1-12
  williamsi, Sup. 2: pp 1-12
  quadrivittata parallela, Sup. 2: pp 1-12
  quadrivittata, 147
  quatuorlineata, 6
elegans, Arizona, 18
elegans, Coluber, 15
elegans, Haldea valeriae, 90
elegans, Pseudemys troostii, 150
Eleutherodactylus luteolus, 128
  nubicola, 18
  ranoides nubicola, 16, 18
Emys blandingii, 3
enydris, Boa enydris, 5
Engystomops pustulosus, 48
Enhydrina schistosa, 122
Ensatina, 40
Ensatina eschscholtzi, 139
Epicrates, 128
Epicrates angulifer, 6
  cenchria, 6
  striatus, 6
  subflavus, 128
eques, Thamnophis eques, 64
equestris, Anolis, 4
erosa, Kinixys, 4
erythrogaster, Natrix erythrogaster, 6, 89, 115, 116
Eryx johni johni, 82, 83
eschscholtzi, Ensatina, 139
Eunectes barbouri, 6
  deschauenseei, 6

murina, 6
Eumeces fasciatus, 49, 88
laticeps, 49
lynxe lynxe, 67, 70
skiltonianus, 86
Eupemphix pustulosus, 48
Euproctus, 36
europaeum, Heloderma, 15, 18
Eurycea, 36
Eurycea bislineata, 42
bislineata wilderae, 61
longicauda, 32
longicauda melanopleura, 49
lucifuga, 32

Farancia abacura, 6
Farancia abacura reinwardti, 89
fasciata, Natrix sipedon, 116
fasciatus, Eumeces, 49, 88
ferox, Amyda, 118, 119
ferreus, Aneides, 139
fimbriata, Chelys, 3
flagellum, Coluber flagellum, 50
flagellum, Masticophis flagellum, 22, 88, 115, 117
flaviventris, Coluber constrictor, 50, 53, 72, 74, 148
flaveseens, Varanus, 82
flaviviridis, Hemidactylus, 82
floridana, Lampropeltis, getulus, 6, 117
fowleri, Bufo woodhousii, 30, 31, 32, 76
fragilis, Anguis, 4
frenatus, Hemidactylus, 81
fulvius, Micrurus fulvius, 149

Gambelia wislizenii wislizenii, 86
Geocleyms reevesii, 3
geographica, Graptemys, 9
geronimensis, Anniella, 27, 28
Gerrhonotus, 44
Gerrhonotus leiocephalus
infernalis, 65, 67
multicarinatus multicarinatus, 46
getulus, Lampropeltis getulus, 106
giganteus, Crodylus, 4
gilberti, Xantusia, 23
glutinosus, Plethodon, 40, 113
goini, Lampropeltis getulus, 101
goniorhynchus, Spehaerodactylus, 128
Gopherus agassizii, 3
polyphemus, 3
gracilis, Tantilla, 90
graciosus, Sceloporus, 86
grahamiae, Salvadora, 16, 18
grahamii, Natrix, 17, 89
granulosus, Triturus, 139
Graptemys barbouri, 10, 106
Graptemys geographica, 9
pseudogeographica, 4, 9, 10
pseudogeographica kohnii, 10
pulchra, 10
versa, 9, 10
gratiosa, Hyla, 3
grobmani, Plethodon glutinosus, 112
grylio, Rana, 120
gryllus, Acris, 120
guianensis, Dracaena, 4
gularis, Cnemidophorus gularis, 125
guttata, Clemmys, 75, 150
guttata, Elaphe, 6, 21, 22, 90, 114, 115
guttata, Elaphe guttata, 118, Sup. 2: pp 1-12
Gyrinophilus, 36, 40
Gyrinophilus porphyriticus porphyriticus, 42

haje, Naja, 6
Haldea striatula, 88, 89
valeriae elegans, 90
hannah, Ophiophagus, 6
Helicops schistosus, 6
Heloderma europaeum, 15, 18
horridum, 4, 91, 92, 148
suspectum, 4, 91, 92, 151, 152
Henicognathus annulata cyclura, 15, 18
henriquesi, Sphaerodactylus argus, 128
henshawi, Xantusia, 23, 24
Hemidactylum, 36, 40
Hemidactylum scutatum, 76
Hemidactylus frenatus, 81
flavivirdis, 82
hernandesi, Phrynosoma douglassii, 144
Heterodon madagascariensis, 146
nasicus nasicus, 128, 134
platyrhinos platyrhinos, 49, 89 148
hilarii, Hydraspis, 4
holbrooki, Lampropeltis getulus, 6, 49, 50, 89
Holbrookia texana, 125
hoodensis (?), Testudo, 4
horridus, Crotalus horridus, 50
horridum, Heloderma, 4, 91, 92, 148
hyacinthinus, Sceloporus undulatus, 49
Hydraspis hilarii, 4
Hydromantes, 36
Hydromantes platycephalus, 40
Hydromedusa tectifera, 4

Hyla avivoca, 78
cinerea, 3
cinerea cinerea, 120
crucifer, 75
gratiosa, 3
phaeocrypta, 78
septentrionalis, 3
septentrionalis brunnea, 128
squirella Hyla, Sup. 2:6
versicolor sandersi, 78
Hynobiidae, 35, 38, 41
Hynobius leechi, 33, 35, 40

Iguana iguana iguana, 5
iguana, Iguana iguana, 5
imperator, Constrictor constrictor, 5, 115, 141
imperialis, Coniophanes imperialis, 60
infernalis, Gerrhonotus leiocephalus, 65, 67
insculpta, Clemmys, 3, 75
insularum, Natrix sipedon, 98
intermedia, Siren intermedia, 19, 20
iodurus, Anolis grahami, 128

jamaicensis, Typhlops, 128
jarrovii, Sceloporus jarrovii, 152
jeffersonianum, Amblystoma, 34
jeffersonianum, Ambystoma, 137
johni, Eryx johni, 82, 83

kaouthia, Naja naja, 83
Kinixys belliana, 4
erosa, 4
Kinosternon baurii baurii, 119
scorpioides, 4
sonoriensis, 4
kohnii, Graptemys pseudogeographica, 10
kohnni, Malacoclemmys, 9

lacertina, Siren, 2, 19, 20
laevis, Xenopus, 3, 51
laeta, Elaphe, 6, 90
Lampropeltis, 140
calligaster, 21, 147
calligaster calligaster, 89
rhombomaculata, 6, 8
doliata annulata, 59
amaura, 90
doliata, 8
triangulum, 8
getulus floridana, 6, 117
getulus, 106
goini, 101
holbrooki, 6, 49, 50, 89
niger, 147
triangulum syspila, 6
triangulum, 6, 47
laterale, Leiolopisma, 21, 78, 88
lateralis, Masticophis, 84
laticeps, Eumeces, 49
laticinctus, Agkistrodon mokeson, 5
latirostris, Caiman, 3
lecontei, Rhinocheilus, 7
leechi, Hynobius, 38
Leimadophis, 128
Leiocephalus carinatus, 5
Leiolopisma laterale, 21, 78, 88
Leptodactylus pentadactylus, 3
Leptodeira annulata, 6
septentrionalis, 108
lesueurii, Physignathus, 5
leucostoma, Agkistrodon piscivorus, 71, 89
Leurognathus, 36, 40
lindheimeri, Elaphe, 6
lindheimeri, Elaphe obsoleta, Sup. 2: pp 1-12
lineatopus, Anolis lineatopus, 128
lineatum, Tropidoclonion, 90
Lioheterodon, 146
logissima, Elaphe, 147
longicauda, Eurycea, 32
longicollis, Chelodina, 3
longissima, Elaphe, 6
lophoma, Cyclura, 128
louisianensis, Triturus viridescens, 94
louisianus, Triturus viridescens, 36
Loxocemus bicolor, 6
lucifuga, Eurycea, 32
luteogularis, Anolis, 4
luteolus, Eleutherodactylus, 128
Lygosoma casuarinae, 67, 70
lynxe, Eumeces, lynxe, 67

Mabouya agilis, 128
Mabuya carinata, 82
spilonotus, 128
macleayi, Cyclura, 4
Macrochelys temminckii, 4
macrodactylum, Amblystoma, 34
macrostemma, Thamnophis, 64
maculatum, Amblystoma, 33, 34
madagascariensis, Acrantophis, 5
madagascariensis, Heterodon, 146
Malacochersus tornieri, 4
Malacoclemys kohnni, 9
Manculus, 36, 40
Manculus quadridigitatus, 29
quadridigitatus quadridigitatus, 29
paludicolus, 29

COLLEGE OF AGRICULTURE STATE MAY 7 1954

uvidus, 29
margaritiferus, Drymobius margaritiferus, 59
marginata, Chrysemys picta, 21
marinus, Bufo, 3
marmorata, Clemmys, 144
Masticophis bilineatus, 18
flagellum flagellum, 22, 115, 117
lateralis, 84
mauritanica, Tarentola, 5
means, Amphiuma, 2
megalops, Thamnophis subcarinata, 64
melanogaster, Thamnophis, 64, 145
melanoleuca, Naja, 6
melanoleucus, Pituophis melanoleucus, 6, 22
melanopleura, Eurycea longicauda, 49
melanura, Agama, 121
melanurus, Drymarchon corais, 6
melanurus, Tropidophis, 7
meridionalis, Triturus, 94
mexicanus, Thalerophis, 7
Microhyla areolata, 78
carolinensis, 3, 78
Micrurus fulvius fulvius, 149
mobilensis, Pseudemys floridana, 4
mokeson, Agkistrodon mokeson, 5, 50
molesworthi, Celestus crusculus, 128
molurus, Python, 82
molurus, Python molurus, 7
monitor, Varanus, 122
moreletii, Crocodylus, 3
Morelia argus, 6
mucosus, Ptyas, 82
mucronatus, Sceloporus mucronatus, 67, 70
mugitus, Pituophis melanoleucus, 117
muhlenbergii, Clemmys, 75
multicarinatus, Gerrhonotus multicarinatus, 46
murina, Eunectes, 6
mydas, Chelonia, 123

Naja haje, 6
melanoleuca, 6
naja, 6
nigricollis, 6
naja, Naja, 6
Naja naja kaouthia, 83
naja, 83
nasicus, Heterodon nasicus, 133, 134
Natrix cyclopion, 90
cyclopion cyclopion, 117, 119
erythrogaster erythrogaster, 6, 89, 115, 116
transversa, 6, 17
fasciatus, 116
grahami, 17, 89
piscator, 6
piscator piscator, 82
rhombifera, 17, 89
rigida, 89
sipedon confluens, 89
insularum, 98
pictiventris, 117, 119
pleuralis, 115
sipedon, 50, 75, 98, 147
stolata, 82
Necturus, 35, 37, 38, 39, 42
nettingi, Siren intermedia, 19
niger, Lampropeltis getulus, 147
nigra, Anniella pulchra, 149
nigricollis, Naja, 6
nigrita, Pseudacris, 86
nigropunctatus, Tupinambis, 5
niloticus, Varanus, 5
novae Hispaniae, Coluber, 15, 18
nubicola, Eleutherodactylus ranoides, 16, 18

obesus, Sauromalus, 45
obsoleta, Elaphe obsoleta, 6, 50, 75, 90, 114, 115, 147, Sup. 2: pp 1–12
occidentalis, Pseudacris, 78
occipitomaculata, Storeria, 90, 150
occipitomaculata, Storeria occipitomaculata, 7
ocellatus, Chalcides, 4
ocularis, Pseudacris, 78
odoratus, Sternotherus, 4, 75
Oedopinola, 36, 38, 40
Oligodon arnensis, 82
taeniolatus, 82
olivaceus, Sceloporus, 125
opacum, Amblystoma, 34
opalinus, Anolis, 128
Opheodrys aestivus, 50, 89, 144
Ophiomorus blanfordi, 122
Ophiophagus hannah, 6
Ophisaurus apodus, 5
ventralis, 5, 89
ventralis compressus, 97
ventralis, 97
ornata, Chrysopelea, 82
ornata, Terrapene, 50
Osteolaemus tetraspis, 3

Pachytriton, 36

Paleosuchus palpebrosus, 3
palpebrosus, Paleosuchus, 3
paludicolus, Manculus quadrigitatus, 29
palustris, Crocodilus, 121
palustris, Crocodylus, 3
palustris, Rana, 49, 75
parallela, Elaphe obsoleta, Sup. 2: pp 1-12
parietalis, Thamnophis ordinatus, 49, 50
parietalis, Thamnophis sirtalis, 86
Pelomedusa subrufa, 4
peltacephalus, Bufo, 3
Pleusios subniger, 4
peninsularis, Pseudemys floridana, 118, 119
pentadactylus, Leptodactylus, 3
persicus, Pseudocerastes, 123
perstristus, Triturus, 94
phaeocrypta, Hyla, 78
Phrynosoma douglassii hernandesi, 144
Physignathus lesueurii, 5
picta, Chrysemys, 75
pictiventris, Natrix sipedon, 117 119
Pipa pipa, 3
pipa, Pipa, 3
pipiens, Rana, 78, 86, 140
pipiens, Rana pipiens, 49
piscator, Natrix, 6
piscator, Natrix piscator, 82
piscivorus, Agkistrodon piscivorus, 115, 116, 117
Pituophis melanoleucus melanoleucus, 6, 22
mugitus, 117
ruthveni, 89
Placopsis, 128
platycephalus, Hydromantes, 40
platyrhinos, Heterodon, platyrhinos, 49, 89, 148
Plethodon, 36
Plethodon cinereus cinereus, 76
glutinosus, 40, 113
glutinosus grobmani, 112
Plethodontidae, 33, 36, 38, 41
Plethopsis, 36
pleuralis, Natrix sipedon, 115
Pleurodelides, 36
polyphemus, Gopherus, 3
porosus, Crocodylus, 3
porphyriticus, Gyrinophilus porphyriticus, 42
porphyriacus, Pseudechis, 6
portoricensis, Alsophis, 5
praesignis, Aristelliger, 128
pretiosa, Rana, 86, 139
Proteidae, 25, 38, 41
Proteus, 35, 37, 38, 39
proximus, Thamnophis sirtalis, 17, 89
prosimus, Thamnophis sauritus, 7
Pseudacris clarkii, 78
nigrita, 86
occidentalis, 78
ocularis, 78
Pseudechis porphyriacus, 6
Pseudemys floridana concinna, 4
mobilensis, 4
peninsularis, 118, 119
troostii elegans, 150
Pseudobranchus, 36
Pseudocerastes persicus, 123
Pseudotriton, 36, 40
Pseudotriton ruber ruber, 76
pseudographica, Graptemys, 4, 9, 10
Ptyas mucosus. 82
pulchra, Anniella pulchra, 27, 28, 149
pulchra, Graptemys, 10
pulverulentus, Dryophis, 83
purpureomaculatus, Trimeresurus, 7
pustulosus, Eupemphis, 48
pustulosus, Engystomops, 48
pyrrhogaster, Cynops, 40
Python curtus, 6
molurus bivittatus, 6
molurus, 7, 82
regius, 7
reticulatus, 7
sebae, 7

quadridigitatus, Manculus, 29
quadridigitatus, Manculus quadridigitatus, 29
quadrivittata, Elaphe obsoleta, Sup. 2: pp 1-12
quadrivittata, Elaphe quadrivittata, 147
quatuorlineata, Elaphe, 6
quercicus, Bufo, 30

radiata, Testudo, 4
radix, Thamnophis, 7, 32, 150
Rana catesbeiana, 49, 75, 84, 115
clamitans, 75, 140
grylio, 120
palustris, 49, 75
pipiens, 78, 86, 140
pipiens berlandieri, 84
pipiens, 49
sphenocephala, 120
pretiosa, 86, 139
reevesii, Geoclemys, 3

regius, Python, 7
reinwardti, Farancia abacura, 89
reticulata, Xantusia riversiana, 23, 45
reticulatus, Python, 7
Rhinocheilus lecontei, 7
rhodorachis, Coluber, 122
rhombifera, Natrix, 17
rhombomaculata, Lampropeltis calligaster, 6, 8
Rhyacosiredon, 34, 39
Rhyacotriton, 34, 38, 40
richardsoni, Sphaerodactylus, 128
rigida, Natrix, 89
rosacea, Elaphe guttata, Sup. 2: pp 1–12
rossalleni, Elaphe obsoleta, Sup. 2: pp 1–12
ruber, Pseudotriton ruber, 76
rugosus, Trachysaurus, 5
ruthveni, Pituophis melanoleucus, 89
russelli, Vipera russelli, 83

Salamandra, 36, 37, 40
Salamandridae, 36, 38, 41
Salvadora grahamiae, 16, 18
sandersi, Hyla versicolor, 78
sauritus, Thamnophis sauritus, 7, 75
Sauromalus obesus, 45
scalaris, Thamnophis, 64
Scaphiopus couchii, 3
Sceloporus bairdandgirardi, 15, 18
graciosus, 86
jarrovii jarrovii, 152
mucronatus mucronatus, 67, 70
occidentalis becki, 47
olivaceus, 125
torquatus, 16, 18
undulatus consobrinus, 140
hyacinthinus, 49
tristichus, 143
schistosa, Enhydrina, 122
schistosum, Atretium, 83
schistosus, Helicops, 6
scincoides, Tiliqua, 5, 141
Scincus americanus, 15, 18
sclerops, Caiman, 3
scorpioides, Kinosternon, 4
scutatum, Hemidactylum, 76
sebae, Python, 7
sellatus, Coluber guttatus, Sup. 2:10
semilineatum, Bascanion, 15, 18
septentrionalis, Hyla, 3
septentrionalis, Leptodeira, 108
serpentina, Chelydra serpentina, 50, 75
sexlineatus, Cnemidophorus, 88, 149
sipedon, Natrix sipedon, 50, 75, 98, 147
Siredon, 34
Siren, 35, 38, 39
Siren intermedia intermedia, 19, 20
nettingi, 19
lacertina, 2, 19, 20
Sirenidae, 35, 38, 41
sirtalis, Thamnophis sirtalis, 119
Sistrurus catenatus, 7
Sistrurus miliarius streckeri, 89, 107
skiltonianus, Eumeces, 86
sonoriense, Kinosternon, 4
Sphaerodactylus argus henriquesi, 128
goniorhynchus, 128
richardsoni, 128
sphenocephala, Rana pipiens, 120
spilonotus, Mabuya, 128
squirella, Hyla, Sup. 2:6
stejnerianus, Coluber constrictor, 53
stejnegerianus, Zamensis, 53
Stereochilus, 36, 40
Sternotherus carinatus, 4
odoratus, 4
odoratus odoratus, 75
stictogenys, Diadophis punctatus, 90
stolata, Natrix, 82
Storeria dekayi, 50, 89
occipitomaculata, 90, 150
occipitomaculata occipitomaculata, 7
striatus, Epicrates, 6
streckeri, Sistrurus miliarius, 89, 107
subcarinata, Coluber, 63, 64
subcarinata, Thamnophis subcarinata, 64
subcristatus, Conolophus, 4
subflavus, Epicrates, 128
subniger, Pelusios, 4
subrufa, Pelomedusa, 4
suspectum, Heloderma, 5, 91, 92, 151, 152
syspila, Lampropeltis triangulum, 6

taeniolatus, Oligodon, 82
Tantilla gracilis, 90
Tarentola mauritanica, 5
tectifera, Hydromedusa, 4
teguxin, Tupinambis, 5
temminckii, Macrochelys, 4

tenere, Micrurus fulvius, 89
Terrapene carolina carolina, 75
triunguis, 4, 50
ornata, 50
terrestris, Bufo, 78, 118, 120
terrestris, Bufo terrestris, 30, 31, 32
Testudo hoodensis (?), 4
tetraspis, Osteolaemus, 3
texana, Holbrookia, 125
Thalerophis mexicanus, 7
Thamnophis butleri, 7
elegans vagrans, 85
eques eques, 64
macrostemma, 64
marciana, 32
melanogaster, 64
melanogaster canescens, 145
melanogaster, 145
ordinatus parietalis, 49, 50
radix, 7, 32, 150
sauritus sauritus, 7, 75
proximus, 7
scalaris, 64
sirtalis parietalis, 86
proximus, 17, 89
sirtalis, 119
subcarinata megalops, 64
subcarinata, 64
tigrinum, Amblystoma, 34
tigrinum, Ambystoma, 85
tigrinum, Ambystoma tigrinum, 2
Tiliqua scincoides, 5, 141
tornieri, Malacochersus, 4
torosus, Triturus, 36
torquata, Agama, 16, 18
torquatus, Sceloporus, 16, 18
Trachysaurus rugosus, 5
transversa, Natrix erythrogaster, 6, 17
triangulum, Lampropeltis doliata, 8
triangulum, Lampropeltis triangulum, 6, 47
Trimersurus purpureomaculatus, 7
tristichus, Sceloporus undulatus, 143
tristis, Ahaetulla, 82
triunguis, Terrapene carolina, 4, 50
Triturus, 36, 37
Triturus granulosus, 139
meridionalis, 94
perstriatus, 94
torosus, 36
viridescens, 40
viridescens dorsalis, 94
louisianensis, 94
louisianus, 36
viridescens, 76, 94
Tropidoclonion lineatum, 90
Tropidonotus Baronis Mulleri, 145
baronis-mulleri, 145
Tropidophis melanurus, 7
truei, Ascaphus, 139
tuberculatus, Alsophylax, 121
Tupinambis nigropunctatus, 5
teguxin, 5
Typhlomolge, 36, 40
Typhlops, 128
Typhlops braminus, 82
jamaicensis, 128
Typhlotriton, 36, 40

uvidus, Manculus quadridigitatus, 29

vagrans, Thamnophis elegans, 85
valenciennesii, Xiphocerus, 128
Varanus bengalensis, 5
flavescens, 82
monitor, 122
niloticus, 5
varius, 5
varius, Varanus, 5
ventralis, Ophisaurus, 5, 89
ventralis, Ophisaurus ventralis, 97
vermis, Carphophis amoena, 89
versa, Graptemys pseudogeographica, 9
vigilis, Xantusia, 23, 26, 148
Vipera russelli russelli, 83
viridescens, Triturus, 40
viridescens, Triturus viridescens, 76, 93
viridis, Crotalus viridis, 5
viridis, Dendroaspis, 5
vittatus, Basiliscus, 4
vulgaris, Triturus, 36

wilderae, Eurycea bislineata, 61
williamsi, Elaphe obsoleta, Sup. 2: pp 1-12
wislizenii, Gambelia wislizenii, 86
woodhousii, Bufo, 85

Xantusia arizonae, 23
gilberti, 23
henshawi, 23, 24, 26
riversiana reticulata, 23, 45
vigilis, 23, 26, 148
Xenopus laevis, 3, 51
Xiphocerus valenciennesii, 128

Zamensis conirostris, 53
stejnegianus, 53
zeylonicus, Chamaeleon, 82

STATE COLLEGE OF AGRICULTURE AND APPLIED SCIENCE
LIBRARY
MAY 7 1954
MANHATTAN, KANSAS